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The Blackpool Electric Railway.

It does not seem improbable that in the very near future the street cars in great cities will be propelled by electricity, and it would be more than useless to point out once more the numerous advantages of this method of propulsion.

The only question is to know to what system the preference shall be granted, and in this view the present organizations bring with them varied information.

Three general systems are at present in operation:

1. The accumulator or storage battery system, which is worked in Hamburg, and which is being organized in Brussels.
2. The underground conductor system.
3. The aerial conductor system, which is in use in some cities in the United States.

The second system includes already several kinds, all of which are working in one or more plants; but all kinds do not give in the same degree the qualities required in practice, viz., in the matter of safety and economy.

Whenever, of course, the road is not exclusively reserved for the cars—which is the case when they have to run through the streets—it is impossible to use two rails as conductors, one for the going and the other for the returning of the current; it becomes then necessary to have recourse to an insulated conductor, placed between the two rails, the two rails serving in common to carry the returning current; but the conditions of establishment, and the practical working of the road thus organized, are as numerous as difficult to fulfill, and are thus shortly described by Mr. Holroyd Smith, who is the inventor of the system which we are about to describe.

Conditions as to Conductors.—Electrical conductors, protected and arranged so as to obtain and maintain a permanent and reliable contact, sufficient insulation capable of being easily cleaned and renovated; facility for inspecting and regular cleaning, and for the removing of the ordinary or accidental dirt which can interfere with the conductor; especial arrangements for the crossings and switches, so as to avoid short circuiting, or interrupting of the current.

Conditions as to Sliding Collector.—Arrangements to fix and maintain a permanent contact, and to avoid every mechanical or electrical accident, in case where the current collector would be blocked.

Conditions as to the Motor.—Especial construction to make it stand the numerous and sometimes hard trials, of the service; control of the driving wheels, as easy and as silent as possible, with little loss during the transmission; electrical and mechanical arrangements, such as will insure a good working of the motor in both directions as well, and its control from one end of the road to the other; simplicity of mechanism, so that the whole arrangement be capable of being understood and put in working order by an ordinary workman; proper provision taken against any serious damage in case of conductor's mistake.

General Conditions.—A sufficient production of electricity to be regulated in the stationary generating establishment. Provisions for safety in case of accidental short circuit. No long stopping in case of accident.

We are now able to go into the description of the system established at Blackpool, a specimen of which has worked in Paris, for experimental purposes, two months ago, near Maillot gate.

The Blackpool street car line is about two miles long. The generating station is situated near the middle of the line, which is the most advantageous condition in an electrical point of view.

It is established in extraordinarily unfavorable conditions, for it goes along the sea shore, and during the bad weather, though the rail level is above high-tide water, it is sometimes washed by the waves. In this case the service is, of course, interrupted on account of the insulated conductor coming in communication with the ground. The return of the current is obtained through the ordinary rails and the wheel tires.

There are ten cars of various forms. The lightest ones are summer open cars, capable of receiving 26 travelers. The largest ones, with upper story, can receive 56 persons. Fig. 1 represents one of the latter.

Motor.—The motor is, according to Elwell-Parker type, excited in series, and capable of revolving in both directions without any moving of the brushes. The change of direction is obtained by reversing the current in the armature, causing thereby an inverse revolving of the latter.

The driving axle is controlled by an endless worm screw acting upon a helicoidal pinion, which thus reduces the angular speed from thirteen revolutions on the motor axle to one on the driving wheel's axle.

The manner of control, which it was feared would waste a large percentage of the power produced by the electric motor, has, on the contrary, given such satisfactory results that the author has the intention to use it exclusively in the new cars.

Fig. 2 shows the chief features of the central conductor, of the current collecting, of the motor and of the transmission of power through the worm screw, which parts are the principal ones in the system.

The central conductor is lodged in a kind of rectangular groove of cast-iron, carrying upon its upper face and also its sides wood pavements soaked with creosote. Cast iron supports are to be found at regular intervals; porcelain insulators fixed upon these supports serve to keep in place the conductor which is made of two copper ribbons of tubular form and which have a longitudinal slit. The continuous groove situated above the cast-iron box is narrower than the distance between the two copper conductors. The arrangement has, for this purpose to allow the falling of stones or other materials to the bottom of the channel without danger of their stopping upon the conductor.

The joinings of the conducting tubes are made by brass wedges which exactly fill the vacuum of the tubes.

The current collector is composed of three parts: a central insulated piece and two cleaning wedges placed at each end, which serve also to guide it in the groove and to prevent it from wedging itself in the latter. The taking of the current is made by two somewhat shell like pieces of bronze, each one surrounding a part of the two central conductor carrying tubes, and making a permanent contact. The central part is electrically insulated with care and brings the current to the motor through a flexible wire which is connected to the central part by a special kind of muff for the following purpose. When the forward cleaning wedge meets with but a feeble obstacle, it repels it and goes on as usual, but when said obstacle offers resistance—such as was the case when large iron pins had been inserted by mischievous parties at the time of the first experiments made at Blackpool—the pulling cord of the collector and the kind of muff just referred to which connects electrically the motor and the collector get both loose. The latter stops, the car goes on on account of its inertia stopping after a little while, but all breaking is avoided. It remains but to remove the obstacle, to hook back the cord and to replace the electrical muff to have everything again in working order.

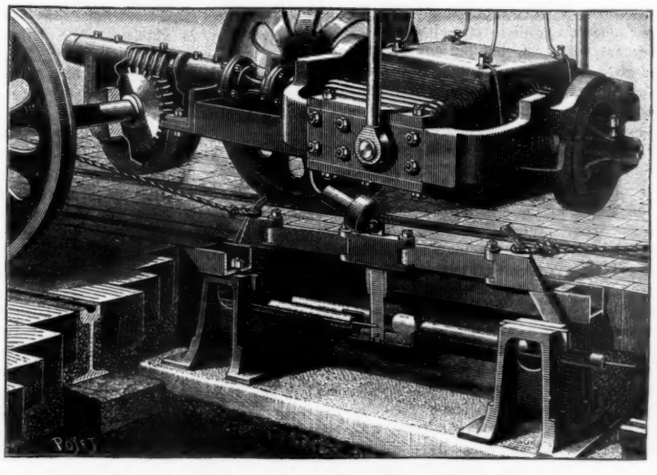

FIG. 2—VIEW OF MOTOR, CENTRAL CONDUCTOR AND WORM [SCREW.

Control.—The starting, the regulating of the speed and the stopping of the motor, are controlled by a switch which inserts in the circuit variable increasing or decreasing resistances. There are two controlling boxes, one for each end of the car; but one only can be used at a time, because the current cannot be admitted to either except by first inserting a movable key of which there is but one sample in each carriage. It is an application of the block system known in England by the name of staff-system.

The central station includes two dynamo machines separately excited by two smaller machines. Each generating machine can produce a maximum current of 300 volts and 180 amperes. In practice, the useful potential varies between 220 useful volts near the central station and 170 volts at one of the ends. The difference comes from the imperfect insulating of the line.

Such are the chief features of the working of the Blackpool electric street car system. Its only fault is the first cost of the building of the central conductor and the losses it causes. Is it better to spend the capital it requires to construct a special road or to buy storage batteries? Both systems have their advantages and drawbacks, and it will be interesting to watch the plants made at Hamburg and at Blackpool with the two systems: they will furnish useful information, and are likely to indicate the manner of economically solving the problem, the result being the practical extension of the system which shall have been recognized as being the most advantageous. LA NATURE.

Postal Telegraph Company Extensions.

The work of constructing an additional line of telegraphic communication between the Pacific Coast and the East has been advancing rapidly during the past few months. The line is known as the Pacific Postal Telegraph-Cable Company, and it is the most important enterprise of the kind engaged in for many years.

About the middle of September last, between 600 and 700 men were set at work building a line of telegraph between San Francisco and a little town in Washington Territory named Blaine, and situated just south of the Canada line. On the other side of this line is the town of New Westminster, the terminus of the Canadian Pacific Railway and its line of telegraph to connect with which latter system the Pacific Coast line of telegraph is being constructed. The 800 laborers were divided into about twenty gangs, and set at work at as many different points along the proposed line of construction. The distance between Blaine and Seattle on Puget Sound is 150 miles, and to span this the lines had to be carried through the woods and over hills along a trail. The greatest difficulties were encountered, but all obstacles were finally overcome, and that part of the work is now completed. The wires were then run from Seattle to Tacoma, along the line of the Puget Sound Railroad, then along the line of the Northern Pacific Railroad to the city of Portland. In this section much opposition was encountered, the railroad people filling in the post holes as

fast as the telegraph company could dig them: but finally the latter corporation triumphed, and the work on this section was completed.

From Portland south both the lines of the railroad and the county road were followed. Special franchises, independent of the railroad company, were obtained for the construction of the telegraph lines.

On Sunday last the company laid its cable between Port Costa and Benicia, as stated from the steamer Whitelaw. Among those present were Samuel Rosener, and J. M. Klein, superintendent of construction.

At an early day—probably next week—a cable will be laid between Oakland and San Francisco. It will be run from Long Wharf, Oakland, to the pier of the Southern Pacific Company at the foot of Market street, San Francisco, a distance of three and a quarter miles.

It is expected that the work of constructing the main lines of the Pacific Coast division will be completed by January 1st, when 1,100 miles of wire will have been laid. Later on the company will extend its lines from San Francisco to Sacramento, San Jose and other prominent points in California.

The temporary officers of the company during the time of constructing the Pacific Coast system are Samuel Rosener, Acting President, and W. D. Francis, Secretary. The permanent officers will be: John Mackay, President; W. C. Van Horne, Vice-President; E. C. Platt, Treasurer, Henry Rosener has general charge of the Pacific Coast division of the service. It is stated that the offices of the company will be located in the Nevada block, corner Montgomery and Pine streets, San Francisco The basement will be occupied by the receiving and delivery departments.

The question of rates is said yet to be an open one. The Eastern system of this company allows twenty words for all messages, and it is possible that the Pacific division may adopt the same plan. The Western Union allows ten words to a message sent East, for which they charge $1. The managers of the Pacific Postal Telegraph Cable Company state that their rates certainly will be no higher than those of the Western Union, and they claim that their service to the East will be much quicker, on the ground that the atmosphere along the line of the Canadian Pacific will permit of a more rapid dispatch of a message than will that in more southern latitudes.

A message sent from this city to the East will go over the wire to New Westminster, Canada, the western terminus of the line of the Canadian Pacific, and from that point will be forwarded over the wires of that corporation, with which the Mackay-Bennett Company has a working contract, to some point on the New York State line, or to Richford, on the Vermont line, where it will connect with the Eastern system of the Telegraph-Cable Company.

The Eastern system of the company, known as the Postal Telegraph Cable Company, connects with the Mackay-Bennett Atlantic cables, one which is landed at New York and run into the office of the company on Wall street, and the other, which is landed at Rockport, on the coast of Massachusetts. This Eastern branch of the company has two systems of wires, one iron and the other copper, which are run from the points mentioned westward to Chicago and St. Louis, and include all important intermediate points. From St. Louis an extension to Omaha has already been completed, and large force of men are at the present time at work on a line between Omaha and Denver. It is stated that the line in course of construction between Salt Lake City and Denver will eventually become a part of this system, carrying it still farther to the westward.

It is stated that the Telegraph Cable Company, having completed its system to Salt Lake, will push forward to San Francisco and when this latter point shall have been reached the corporation will control two lines of telegraphic communication between this coast and the East and Europe.

* * The cost for operating electric cars in Baltimore is said to be $4.00 per car per day.

Incandescent Lamp Manufacture.

Our esteemed contemporary, the London *Electrician*, says:

"Perhaps nothing so simple is so little understood as the incandescent lamp. It is merely a piece of carbon enclosed in a globe with the air pumped out; yet it costs 5s., without any obvious reason, and the cost of electric lighting is more than doubled by people not knowing how to run their lamps properly.

"As no full account of the manufacture of incandescent lamps has yet appeared, it is hoped an attempt may be welcomed not only by those who are already engaged in lamp manufacture, but also by those whose success depends on their proper use, and by the large class who take an interest in a manufacture that involves so many branches of applied science.

"It is the policy of incandescent lamp makers to keep their processes and modes of manufacture as secret as possible. At first this was, no doubt, very good policy on their part, but it is questionable if it does them much good now. The result of it is that each maker has to go through a number of tedious and very expensive experiments, which might have been saved. Moreover, the secret processes so jealously guarded are probably much the same in different factories, and the success of a lamp maker must soon depend, not on secret processes but on good business management, not only in making but in selling his lamps. The present high price of lamps is not due to labor in making but to superintendence, to waste through manufacture of bad lamps, which are or are not sold, and to bad business management and waste of money generally. In addition, large sums have often been paid for patents of doubtful value.

"There is no exception in the case of incandescent lamp making; it has to go through the same vicissitudes as other branches of electric lighting. We blame the Electric Lighting Act, as it is a very convenient scapegoat, but the slow progress of electric lighting is mainly due to our own incapacity, not to legislation or to speculative companies. Electric lighting, as a new business, needed men who had technical knowledge as well as business capacity; and even now, after four or five years' work, an electrical engineer knows less about his work, in proportion to the position he holds, than most other professional men. This, of course, is unavoidable in a new industry. To begin with, electrical businesses had to be managed by men who were either scientific and unbusinesslike or businesslike and unscientific; much was done by people who knew nothing either of science or business. The result has been that what may be called electric light management has arisen, its most obvious features being great hurry with no speed, great expectations with no reason for them, and generally doing everything at night that should be done in the day. The industry is looking more promising now, as electricians are gradually acquiring business habits, and business men see that it is necessary to be technical also.

"Incandescent lamp making is the most purely scientific branch of electric lighting, and it has therefore suffered most from unbusinesslike management. It is probable that lamps will gradually fall in price during the next few years as lamp factories are better managed. These articles cannot, unfortunately, give any useful information on the subject of management; but it is hoped they may be found of technical value to lamp makers themselves. Of course every lamp maker thinks he, and he alone, knows how to make lamps; but though each manufacturer knows a great many things unknown to other people, he is also ignorant of many things known to almost everyone else. It will be the writer's endeavor, therefore, to give as full an account as possible of what he knows and of what he has found in his own experience. This cannot but tend to help lamp makers out of some technical difficulties, and to reduce lamp making to its proper level of a commercial manufacture with legitimate profits. Electric lighting may be said to be on a firm basis when people give up inventing and substitute designing; lamp making when success depends on well organized manufacture, not on patents or processes.

"As the writer can only describe what has come within his own experience, it must be understood that when he writes about his own processes and apparatus, it is because he knows them best, not because they are in universal use or particularly good.

HISTORY.

"It is unadvisable to write a history of the incandescent lamp here, for several reasons. In the first place, this is not an encyclopædia article; and, in the second place, the history of the incandescent lamp is to be found almost word for word in the numerous books on electric lighting published in England and on the Continent. One of the best accounts is in 'Electric Illumination,' by James Dredge. The idea of using a thin carbon in a vacuum for lighting is at least half a century old. About 1836 the question of lighting mines more safely seems to have occupied great attention in Belgium. It was then proposed to use carbon in a vacuum. It is very difficult to find out much about what was done in those early days, as papers of that date are not easily got. The earliest mention of incandescent lamps seems to be in the *Courier Belge*, of 1836, quoted by Louyet in the *Comptes Rendus*, 1846, page 225; '*Nous voulons parler de l'incande-cence de charbon produite dans le vide au moyen d'une pile voltaique.*' It appears that De Changy took the matter up soon after, and he seems to have worked both with platinum and carbon, but to have been more successful with platinum. It is difficult to find out much about De Changy's lamps. Most of the accounts of electric lights in those days are too vague and exaggerated to be of much use now. It seems, however, from a technical account that appeared in one of the French journals, that De Changy's lamp, as exhibited, was a platinum lamp. The next period of activity in electric lighting was between 1845 and 1855. Anyone interested in the history of lamps will find many accounts in the *Mechanics' Magazine* of that time. The electric light seems even then to have been a mere curiosity, useful for displays, or for astonishing fish; but the cost of primary batteries prevented its commercial use as an illuminant. Any further information can be got from the excellent article in "Electric Illumination" already mentioned. The incandescent lamp was not invented by anybody. It was a gradual growth, like the arc lamp; and immediately the dynamo became a commercial success, and the incandescent lamp was wanted, it was forthcoming. Those who have studied, not only the arc lamp patents, but the electrical patents generally, of forty years ago, must see that very little new has been brought out during the last six years; the only thing wanted to make both arc and incandescent lighting a success even then was a commercial demand for it. If credit is due to anyone for the introduction of the incandescent lamp, it is to Swan, Lane-Fox and Stearn for doing the work, and to Edison for making a noise about it. There are, no doubt, many subordinates who have done good work, but whose names naturally do not come before the public, such, for instance, as Mr. F. Topham, Mr. Stearn's ingenious assistant. Incandescent lamp makers are also indirectly indebted to Mr. W. Crookes for his work on high vacua. It is probable that incandescent lamp makers, though they may be unable to tell scientific men much about very high vacua, may be able to show them how to make very much simpler and better pumps than those used in the laboratory; yet this is but a slight return to Sprengel, Geissler and Crookes.

PREPARATION OF THE CARBON.

"The first quality necessary to a carbon is that it should be durable at high temperatures in a vacuum; the second that it should be easy to make; and the third that it cannot be made of any size, surface, or resistance that may be required. The commonest cause of failure is not, as might be supposed, the first, but the third. People have often made a few lamps in the laboratory, and concluded that they have invented a lamp, and that there is nothing further to do but to make it in large quantities. The disappearance of the numerous lamps that have been brought out one after the other during the last few years is mainly due to the impossibility of making them wholesome. The inventor who has made a few dozen lamps with some new form of carbon, so far from having done his work, has only just begun it, and, as likely as not, has begun it wrong. He afterwards has to invent or design apparatus for manufacturing on a large scale with uniformity.

"The different forms of carbon may be subdivided and treated separately. The various kinds commonly used may be classified as:—

"Retort carbon, or carbon deposited from gaseous hydrocarbon by heat.

"Vegetable carbon of organic structure, such as carbonised paper, bamboo, roots, scrubbing brush bristles, &c.

"Amyloid, as used by Swan, Weston, and the Anglo-American Brush Corporation.

"Animal, such as silk, catgut, etc.

"Chemically, deposited, as Smith's.

"There are a few varieties not included in the above list, but they can be described separately."

Glass for the Wimshurst Electrical Machine.

Mr. Wimshurst says in the *English Mechanic*: "I have always endeavored to press upon your readers the great necessity of testing the quality of glass about to be used for electrical purposes, and now, for the information of so many as may also be the makers of electrical machines, I may state that, notwithstanding my full knowledge of the necessity of testing, yet I have fallen into the trap. It occurred in this way. I was wanting a considerable number of disks, and before buying I obtained and tested several samples of glass. The result not being satisfactory, the dealer then obtained for me a case of the 'Bell' brand quality. From this I again made tests, and found everything to appear to be as I wished. The natural supposition was that the many samples tested fairly represented the quality of the whole, and I proceeded to cut thirty disks from the flattest of the sheets. It was only when the machine was finished that the truth became manifest, for then out of the first eight disks put into use three were of such bad quality glass that not only did they refuse to work, but, further, they conveyed away nearly all the electricity produced by the other disks. Of course, the three bad-quality disks have had to be replaced by others.

"The lesson is that testing by sample is not sufficient. Each disk ought to be separately tested before being put into use."

What a Western Official Said of Brooklyn's Police Arrangements.

Brooklyn has a great many institutions to boast of that one-half of her people don't know anything about. A police official from a city in the West visited Brooklyn a week ago and went away from the City of Churches saying that if he could make the improvements that he wanted in his own force he would keep Brooklyn in his mind. The police telegraph system was what impressed him most favorably. There is no denying the fact that it is the best in the country. Twenty precincts communicate with headquarters by means of the telephone and dial telegraph instruments. If one breaks down the other is in use, and serious delay is out of the question. Precincts are always in communication with one another, and messages are delivered and taken while New York's police officials are studying out the first sentence of the old, slow-going dial. All Supt. Campbell has to do when he wants to talk to officials in Sing Sing, Crow Hill or Trenton penitentiaries is to step into his office and call them up. Any captain in Brooklyn can do the same thing, but New York captains

have to either go to Headquarters or give their business away while shouting in some neighboring establishment where there is a telephone. Another thing that impressed the Western policeman about Brooklyn was the openness with which all business around headquarters is done.

"You give the reporters pretty wide latitude," said he to Supt. Campbell.

"Why not?" asked the latter. "They expose crime in all its details and contribute towards preventing its repetition. Too much secrecy doesn't do, although some police officials think so and act up to their thoughts. I've been a newspaper man myself."

The force consists of F. C. Mason, Superintendent; with Operators Gear, Williams, Cornell, Keenan, Campbell, and Maloy; Linemen, Manee and O'Connell; Messenger Officer Alex. Guire.

The Practical Test of an Electric Railway at the R. I. Locomotive Works.

The Providence *Journal* says that upon the premises of the Rhode Island Locomotive Works there is laid a section of car track just one-tenth of a mile long, with curves and gradients. Here may, upon occasion, be seen the somewhat singular sight of what appears to be an ordinary horse car, minus the horses, running smoothly and noiselessly at a rapid rate of speed, without any apparent source of power. A man standing in the driver's position upon the front platform, with a turn of what upon the ordinary street car is the brake handle, stops the car, starts it, suddenly or gradually at will, and regulates its speed, from a snail's pace to a five-minute gait, as he chooses.

This is the practical test of the electric motor which, after a year of experimenting at the Locomotive Works, has been perfected by the engineers of the Bentley-Knight Company, of New York. They have made it especially to be applied to street cars and elevated railroads, and have already a number of contracts under way for its introduction in several cities.

The horse car is precisely like those that travel our streets, and, indeed, was purchased of the Union Railroad Company, to be fitted with the electric appliance. Between the axles and underneath the floor of the car is a little machine that occupies a space of 30 inches square by 10 deep. To this an electric current is conveyed from a conductor in a sort of underground conduit near the track—its position whether between the rails or to one side is immaterial—by means of a sort of spring shoe or "plough" upon the card which bears upon the conducting rail with elastic pressure. This current is thus conveyed to the motor, which is nothing more than a sort of miniature dynamo. Now, it is a principle in electric physics—a principle of comparatively recent discovery and of great importance—that while a dynamo, operated by outside power, generates a current of electricity, that same current introduced into another dynamo will cause it to revolve and thus to generate power again. This principle of the "reversibility of the dynamo" is what renders possible the application of electricity to motive power, and is what is here employed. The current causes the motor to revolve, and the latter then communicates its motion to the axles of the car wheels through a system of gearing. This is the simple principle of the contrivance; but the perfection of the details has occupied many months of experimentation. The electric system in our streets would require but little change in existing appliances, the chief of which would be the underground electric conduit. This would be small, far smaller than that required for cable roads, and much easier to keep clean, because there is no mechanism inside, and it can be easily and constantly swept out by appliances upon the cars themselves. People who have seen the cable systems in Chicago say that there is an almost constant miasma from the cable conduit, which is practically a great sewer stirred up by every car and cleaned but twice a year. The fact that any desired speed can be maintained, even so great as twelve miles an hour on outlying districts if desired, permitting also slowing up in going around curves and in crowded streets, is another considerable advantage over the cable system. The advantages over the steam elevated system are too obvious to require enumeration.

The tests that have been given under the new motor so far seem to have been successful. The car has been run under the many conditions that would be required of it in actual street work in cities; it has been run loaded heavily with people—forty have ridden in it at one time, causing no diminution of the speed—it has been driven up steep grades and around sharp corners, started and stopped and run at slow speed, and apparently responds without failure to all such demands.

Of course, this, to the minds of directors of street railways, which are run to make money, is but the beginning of the demonstration that they would require. Economy is the most important element; and this is a much more difficult matter to determine. With reference to a comparison with locomotive engines, such as are used on elevated railroads the engineers of the electric company give figures which seem to indicate a decided advantage on the side of electricity. Locomotives can develop a horse-power by the use of from six to sixteen pounds of coal per hour. The higher figure is nearer what, for several reasons, is found to be the experience on the New York elevated roads. But a stationary engine develops a horse-power from about two to two and one-half pounds of coal per hour at the outside. And of the power employed the electric motor wastes about fifty per cent., wherefore it can develop a horse-power from four pounds per hour. Furthermore, while every locomotive requires two men, one of whom is in the highest and most expensive class of skilled labor, two engineers and three firemen are sufficient for the one or two engines operating the electric plant of a street railway system of 200 cars. The drivers of the cars can be taken from the same grade of labor as at present. The wear and tear of a stationary engine is, of course, insignificant compared with that on a locomotive, and the simplicity and solidity of the motors make the wear and tear upon them of insignificant amount. A comparison with the expense of a horse railroad line is, of course, more difficult and more a matter of conjecture, and the results could perhaps be definitely determined only from the experience of both.

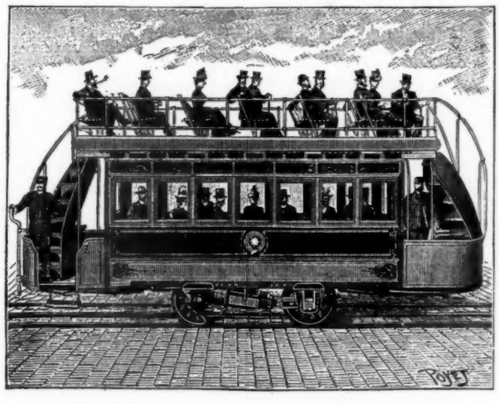

FIG. 1—CAR CAPABLE OF CARRYING 56 PERSONS, USED ON THE BLACKPOOL ELECTRIC RAILWAY.

—— The electric light is an advantage to vessels going through the Suez Canal, the Salazie, belonging to the Messages Maritimes, having recently made the passage in sixteen hours, passing twenty-two vessels *en route*.

...The Brockton, Mass., City District Telegraph Co. filed its certificate of incorporation yesterday in the County Clerk's office in New York city. It has a capital stock of $15,000, with the privilege of increasing to $25,000. The company is to run its lines of telegraph from Brockton, Mass., through that State and Connecticut, to New York city.

Poles and Electric Light Wires in Brooklyn.

The opinion of Corporation Counsel Jenks, in response to the questions asked by the Electrical Subway Commission, of Brooklyn, as to its powers and duties in dealing with the Electric Lighting Company, is regarded as practically taking the edge off the question in Alderman Corwin's resolutions, which were referred to the Law Committee. The object of the resolutions was to prevent the further erection of poles except in strict accordance with law, and to urge the Subway Commission to do its duty in the premises. So far as the Telephone Company is concerned, it wants no more poles for the present, but the Electric Lighting Company does. There seems to be some misunderstanding of the purport of Mr. Jenks' opinion. The Subway Commission had a duty to perform in causing to be devised a plan for substituting the underground system for the overhead system of electric lighting, and it neglected that duty. Nothing can be done toward bringing these wires down until it does that duty, and Mr. Jenks plainly says so, and the poles and wires will continue to stand, and new ones erected if needed.

A Good Battery.

The following details of a primary battery test by "Cato" in the *English Mechanic* will probably interest some of our readers:

"The cells were constructed with the object of obtaining a constant current of about three amperes over a long period of time, and are my own invention; the test was conducted by a Doctor of Science well known in London, and I did not even see the cells after I had charged them.

A few experimental tests were first made to ascertain the internal resistance, total capacity of the cells, etc., and then sufficient resistance was placed in outer circuit (which was not altered during the whole of the test), and a current of 3.45 amperes per cell was taken. The following extracts from the table of results will show the constancy:

At start	3.45 amperes
11th hour	3.45 "
50th hour	3.45 "
98th hour	3.30 "
122nd hour	3.13 "
155th hour	2.27 "

"The E. M. F. was slightly under one volt per cell, and up to the 130th hour only fell eight decimal points. The actual internal resistance was .087 ohm per cell at starting.

"A cell was then tested for local action. After being short-circuited for 9½ hours, the positive plate was weighed accurately and replaced in the cell. At the end of eight days it was again weighed, and was found to have lost only 3.80 grammes, or practically *nil*."

* * The *Sun* of to-day says that a downtown business man received yesterday a telegraphic dispatch, forty-seven words in length, that had been actually sent from on board a train moving at the rate of fifty miles an hour over the Lehigh Valley Railroad. It was the first practical working test that has been made since the putting of the Phelps induction system upon a section of fifty-eight miles of this road, and its results, notwithstanding the heavy snow, were very good, messages being sent from and received upon the swiftly moving train with accuracy.

Sellon's Form of Secondary Battery Plates.

John A. Sellon says in the London *Electrician*, with reference to the form of secondary battery plates lately put forward somewhat prominently by Mr. P. Gadot, of Paris, the form and arrangement claimed being lead plates with conical perforations, packed with oxide of lead, and fixed face to face so as to retain the active material in position. I would mention that in my specification, No. 3,926, September 10, 1881, I fully describe and illustrate the fixing together of two packed perforated plates, and in a later specification, No. 2,818, June 15, 1882, the use of conical and other suitably-formed perforations for keeping in or retaining the active material. Such double plates were experimented upon by me in 1881-2, but they have some obvious disadvantages both in their primary manufacture, cost and subsequent use. With regard to the attachment of the active material to the ordinary single grid plates, if well made and properly treated, no difficulty occurs, the falling out of the solid cones or squares of peroxide of lead arising only when bad workmanship or usage come into play. I have had such plates in continuous use for more than four years, from which not a single plug of active material has become detached or loosened.

On the first day of January next Albany's new fire alarm telegraph system will be put into operation. The new alarm boxes, with but few exceptions, are already in position. Under the new system the city will be divided into eight districts, containing 144 fire alarm stations. This system is manufactured by the Western Electric Company, and is one of the best, and embraces many new and important improvements.

The Electric Light in Altoona.

Editors Electrical Review:

Here is a little news that may possibly be of interest to your readers. Altoona, Pa., has at last waked up and cast off allegiance to the gas company, and has taken up with the electric light; the introduction of which, even at this early day, has had the salutary effect of reducing the price of gas ten cents per thousand. We have the Edison system here, and the Mass. Electric Illuminating Company constructed the plant which is a model of thoroughness and good work; the station is large and well arranged; the power which runs the dynamos is generated by three 120 horse-power boilers and three engines, one of 90 and two of 140 horse-power. The engines and boilers are of the Taylor Manufacturing Company of Chambersburg, Pa., and are models of their kind. The electric plant consists of six dynamos, collective capacity 3,000 lights, four large dynamos of 600, and two smaller ones of 300 each. Two machines are belted to each engine. The ammeters and indicators are arranged very conveniently so that one can note the condition of all the circuits from one point in the room. The company has contracts for over 2,000 lights, but at present have only about 1,200 in operation; the remainder will be working in a week or two. The city has contracted for 24 lights of 32 candle-power each, to take the place of the gasoline burners on Eleventh avenue. Although the lights are few, this is the most decided improvement of all, as at one time the city used gas for the street lights, but discarded it in favor of gasoline; as this was a downward movement in the scale of light we were next expecting tallow dips instead of the electric. Everybody is well pleased with the light, and it gives satisfaction.

Altoona, Pa. W. R. PRIOR.

* * "ELECTRICITY IS LIFE."—I agree with "Louisa Gotham" when she finds in electricity the wonderful force that is so much discussed just now. It is life itself, in my judgment, this mysterious, all-pervading power which man is just beginning to understand. Telephony, telegraphy and theosophy are more nearly allied than many imagine.

E. L. E.

ELECTRICAL REVIEW

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NEW YORK, DECEMBER 18, 1886

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ELECTRICAL WELDING.

Notwithstanding the rapid advance in all branches of electricity during the past ten years we venture to predict the new process of electrical welding, shown before the Society of Arts, of Boston, is one not only of exceptionable value, but which marks the present year as one in which a truly great discovery has been brought to the notice of the scientific world. Metals which have not before been welded, or perhaps, with great difficulty, and in many cases imperfectly brazed, are now united firmly to unlike metals or to the same metals with the greatest ease. The accuracy of alignment obtained the finished piece, the very slight loss of length attending the operation, the strength of the joint made are improvements the mechanical world may have dreamed of, but certainly has never expected. The saving in the cost of tools, now that steel points may be in 15 seconds united to an iron bar, and that, too, without drawing the temper in the steel for more than ¾ inch, will be of no inconsiderable amount. The cheap aluminum which the Cowles Electric Smelting Company are soon to put on the market can now be easily welded where a solder of brazed joint is out of the question with that metal, on account of the difficulty of the process. A story is told of a blacksmith who was required to weld a piece of iron to a shaft four inches too short. The piece of iron was 12 inches long. After successfully uniting the two pieces and hammering the joints, at the end of five hours' time it was found that the shaft was two inches shorter than at first. By Prof. Thompson's method what has been the weakest form of joint (but weld) is now made as strong as any part. Nothing has been mentioned in regard to uniting the edges of plates together. Necessarily the current required to join two boiler plates together would be enormous, but not beyond the region of possibilities.

A SPIRITUAL CRITICISM.

A writer to our contemporary, the *Herald*, signing himself "Owl," complains that the electric light is beginning to be used in art galleries, and to his mind this is a mistake, for that it destroys the best effects of a picture, obliterates the coloring under certain circumstances and makes them absurdly glaring under others. The impression grows on one while reading "Owl's" letter—an impression which, we may say, strengthens as we continue—that our wide-awake friend refers more particularly to Mr. Ed. Stokes' art gallery up town and perhaps Mr. Stewart's art "warehouse" down town. It is easily seen, too, that "Owl" is not a careful observer and investigator. What he meant to say—and we ask pardon if we misstate his intention—we say what "Owl" meant to say was that the electric light has a worse and worse effect upon art as the night advances, or, to be more carefully accurate, as the artist behind the bar puts less and less water in the artistic material he dispenses.

One cannot read "Owl's" letter without at once recognizing him as a lover of the beautiful and a devotee of spirituality, though not at all times in the habit of adding the reality or the other necessary, viz., water. But because he is a lover of these things his complaint should receive careful and serious attention, for we are not of those who would abuse and ill-treat those who disagree with us as to the electric light or anything else. Still, we do think that "Owl" is to a certain extent mistaken, and if these remarks should meet his eye we beg of him to study this subject of electrically lighting pictures from a less spiritual standpoint; to bring to it that repose, not to say steadiness of thought and eye, which comes of sobriety—we mean, of course, intellectual sobriety. It is surely a mistake to believe, as many do, and undoubtedly "Owl" is among the number, that imbibing the products Jamaica and Holland, and Maryland Club is a necessary preliminary in order to judiciously decide upon the merits of a work of art. To our mind such preparation is not absolutely necessary.

The merits of a work of art have been said by Ruskin to often rely upon the stand point from which it is studied as well as upon the conditions which may be present. We say to our mind Ruskin might have gone further and declared that the merits of a work of art rely not only upon the standpoint from which it is viewed, but also upon the condition the person is in who is viewing it. This fact was made very clear to us the other day, or rather evening, when visiting Mr. Stokes' art emporium, we observed a man intently studying that charming painting "The Nymphs and the Satyr." He stood with knees somewhat bended, as if in reverence for the skill displayed by the artist, and his body at times leaned forward and at times swayed sideways, but was for the most part bent over backward; these positions being assumed apparently in order the better to study and analyze the picture at various angles. After some time this student of art shuffled slowly over to an artist in a white apron standing behind a long high counter who was engaged in describing a crescent with a liquid falling from a glass above corresponding to one held below. He leant over the counter and asked in a whisper:

"Wh-ash—masher—wish—pic-shure—— S' up-sish—down—B' gosh!" And so it goes. Every one judges according to his artistic capacity or condition, and so one should be careful not to complain of art work or the quality of the light, whether natural or artificial, unless they are assured they are right. Would "Owl" mind saying what his temperature was, and in what condition of spirituality he had arrived when he rendered his decision about the electric light?

The Executive Committee, of the National Electric Light Association, meets at Hotel La Fayette, Philadelphia, Tuesday, December 21, to complete arrangements for the February meeting.

BLAMED IF THEY DO, AND DAMNED IF THEY DON'T.

The ratification sent to the Brooklyn Subway Commission last week from the office of the Corporation Counsel was a staggerer! Therein the Commission was informed that they could not force the electrical companies to bury their wires until they were provided with a means under ground capable of giving as good service as that to be had over the aerial lines. To the ordinary mind it would seem as if this ponderous opinion might have been given a little earlier in the day before the Commission had actually gone into the business of selecting a system of conduits, and before those responsible for the working of the same had expended so much time and money. Both the Brooklyn and the New York Commission have struggled long and earnestly to carry out the law under which they were appointed. They have withstood unreasonable reproach by the press and calumny, and have pushed on their labors without one act of assistance, one word of encouragement or one smile of favor, and have finally brought them to the verge of completion, only to be told that they had no right to carry out what the law, if plain language means anything, distinctly implies. They have selected a system of conduits which is, at least, as good as any that have been presented, besides possessing the recommendation of having been tried in many places with what must be looked upon under the circumstances, as fairly good results. Had they been told at the outset as they have now been told that they must furnish in the ground as good a service as can be had through the air, they would, of course, as reasonable human beings, decline to take any steps whatever in the matter. Indeed, had the commissions been able to accomplish so difficult a task they might fairly have been regarded as the most expert and accomplished scientists of the day, and their names would have been handed down to posterity, as worthy of place beside those who have most distinguished themselves in the realms of scientific exploration.

We have often insisted in these columns that nature's laws can not be altered by statute any more than the motion of the earth can be lessened or accelerated by the legislative enactment. There are such things as induction and retardation, and these, like an innumerable host of other phenomena, are not yet, if they ever shall be, fully under our control.

The Brooklyn Commission are now in the position of a man trying to feed an ugly mule. If he doesn't feed him the animal will die, and if he tries to feed him he'll be kicked to death If they don't insist upon the electrical companies burying their wires they'll be accused of accepting bribes, being bought off, and general boodleism; whereas if they do insist, the service will prove defective and uncertain, and they'll be accused of forcing upon the public a poor subway in which they own stock.

The most astonishing thing about this whole matter is the profound ignorance of the popular press upon this matter. So far as has yet appeared, the Brooklyn *Citizen* is the only journal which has yet taken a reasonable view of this matter, or shown sufficient intellectual acumen to grasp the points at issue. The press has insisted and is still demanding that the wires be buried forthwith. It doesn't matter to them that underground telegraph service suffers retardation from causes which the most learned and skillful scientists have been unable to account for, prevent or to in any large degree lessen. The news has not yet reached them that there is a phenomenon called induction, the expression of what would seem an attempt by nature to establish an equilibrium, which plays the very mischief with underground telephone wires rendering them oftentimes useless without there being present any means of discovering the exact point of the trouble, or just how it can be corrected.

From the general public nothing like intelligent comprehension can be expected. They have not the time even if they had the inclination to look into such matters; and even if they had both, it would probably require a surgical operation to fix the matter aright in their minds.

Only last week there was a meeting of "indignant citizens" in Brooklyn to protest against permitting poles any longer to be permitted to "block up" the public streets. They insisted that all wires should be at once placed underground "where they belong," and that "the Subway Commission be prevented from allowing the electrical companies to any longer laugh at the law."

Yet if the electrical companies should stop laughing at the law and bury their wires, and the service should be poor, this same public would stamp and roar with rage. "Consistency, thou art a jewel!"

CHICAGO ELECTRICAL NEWS.

William Wesley McCaw is a fugitive from justice at Indianapolis. Ind., and is wanted in Illinois for the murder of a telegraph operator, at Marshall Junction, some weeks ago. An amateur detective, whose other occupation is running a pool room at Marshall Junction, produced an affidavit upon which he desired to obtain the custody of McCaw, which turned out to have been sworn to by Harry Jones, an ex-convict, who is at present in custody for personating an officer. The game didn't work.

Chicago is just starting in to erect the largest opera house in the United States, and the largest save one in the world. It is only inferior to La Scala, at Milan. The structure is to be erected at the corner of Michigan avenue and Congress street, with main entrances on each of these thoroughfares, the latter being the principal entrance to the auditorium. The edifice will be ten stories high, with a tower of three hundred feet over the Congress street entrance.

The auditorium, on all ordinary occasions, will seat 5,000 people, while for conventions and other great public gatherings the seating capacity will be increased to 8,000. The present design contemplates two balcony rows and fifty-one private boxes. with 3,000 seats on the main floor. The stage will be 70x120 feet. The hotel portion will comprise rooms for 500 guests, as well as all other necessary hotel accommodations, and will be conducted on the European plan. In the language of one who seems largely interested, "She's a daisy, and you can gamble that they don't want no snide lighting system Still, as there have been no specifications yet published the "other fellows" have no just cause for discouragement so far.

Missouri, celebrated in the annals of history as the State in which the battle of Wilson's Creek was fought, "mit Siegel," has gone to killing people in mid-winter with thunderstorms. Near Edina, Knox County, a few days since, a father and three sons were all stricken down in a corn field by a stroke of lightning. Two of the young men were killed, while the father and the remaining son were badly stunned.

The Chicago base ball park, unavailable for its legitimate purposes during the cold season. has been converted into a toboggan slide and a skating park. The opening festivities commenced on the evening of the 7th by a grand procession of red and white blankets and other fancy woolen goods carrying toboggans under their arms, and some sort of animated beings inside of them, which filed up the long, high hill, looking for all the world like a lot of Indians on their way to a sacrifice. It was the Oakenwald Tobogan Club, headed by Captain Anson, of the Chicago base ball nine, and the way those people came down that hill near one-seventh of a mile, was suggestive to fleshy elderly people of the possibility of being able to see just as well a little way back.

The park and slide are illuminated by fourteen Vandepoele arc lights, and a lot of

incandescent glows which are sparingly distributed through the rooms of the building.

On the 7th instant the Bell case in Ohio was formally and finally disposed of. Judge Shurman, speaking of the co-defendants in the case was kind enough to remark that, "the big whale got out of our net, and we had to let the minnows go too." The circus will now take the road, and bill for the next show in Massachusetts.

While on this Bell business it is meet to mention another telephone which "does away with distance"—and this too from that fertile State which has already done so much in the electrical line. This telephone, which-is-better-than Bell's, bearing consecutive number four thousand eleven hundred and forty-four, (4-11-44) is known as the Barriett-Nelms, being the invention of two young men of Houston, Texas. They tested the apparatus the other day in the presence of the usual traditional number of prominent citizens, over 830 miles with a metallic circuit, and the result was, as usual, far more satisfactory—etc., etc., etc. The correspondent says :

"The new invention differs from the Bell, Edison, and all other telephones, inasmuch as it combines the effects of an induction coil and the helix of a handphone, causing them to act simultaneously and in concert with each other by winding the coils in the same direction and using a carbon diaphragm with the carbon intact, thus enabling the use of a large amount of battery. Yesterday's test was made with three cells for a short distance. No battery whatever is required, the automatic dynamo-current being sufficient to articulate with great distinctness and steadiness. The inventors claim that they can talk from New York to San Francisco with the same distinctness as yesterday's test. A caveat has been issued on the new instrument, and the Patent Office is now considering their application for a patent."

The youthful artist who frequents the writer's premises, steals cigarettes, writes poetry, and daubs the foot gear of the office under pretense of blacking, says of the above case :

"Two young electricians of Houston
Made a 'phone they believed they could boast on :
But they never can tell
Till they've seen Mr. Bell,
Whose office is over in Boston."

It has been said that a lie is a winged centipede, while truth travels like a tortoise. A statement has somehow got abroad that the Chicago underground system is a failure, because, says somebody—one of those fellows you can never drive into a corner—"the manholes and pipes are always so full of gas that the conduits are constantly blowing up." Information on this subject has been diligently sought, and so far as heard from—the back counties are pretty much all in—the whole scare-cat story arises from some little difficulties which were overcome long ago. There have been no explosions in the Chicago conduits that the electric light companies know anything about, except some gray-headed ones which occurred in the early days. These resurrected—are made to do duty as arguments to show that the placing of electric wires underground is impracticable, dangerous, bad, generally. It is a li tle funny now to look at the arguments which have been brought up to prove the impossibility of placing the wires underground, and working them after being so placed.

First there was induction, and his fellow electrical tramp, retardation. The duty of one of these was to keep up a sort of devil's dance between any two wires which were placed below the surface, and especially if one of these was an electric light wire, while the other was to stand by, and whenever the former was ill, or from any cause unable to perform his functions, retardation was to step in and fasten its "come alongs" on to the current impulses and draw these out backwards, like pulling taffy, until ordinary conversation would become a sort of vocal marmalade, or jam. Then there was the insulation question. Such a thing as a megohm to the mile was preposterous, and the incandescent people, as well as the arc light folks threatened to go out of business, when the Chicago ordinance first saw the light, because to comply with its provisions was death to electric light enterprises—all of which arguments and as many more, colored and forged into the required condition to fill each individual case, have been thrown into a cauldron and crystalized into just this and nothing more :

$ $ and c. c.

All the wires work, and work well, when properly put into the conduit—the conduit works well when properly put down—and the electric light people and the telephone people and the telegraph people have seen the fallacy of their ways, and will be a great deal happier in the sweet bye and-bye, when the wires have all gone underground.

The *Scientific American Supplement* of the 11th republishes a paper read before the insurance people in Chicago, in September, by your correspondent. A discussion as to the systems of arc and incandescent lamps, cuts of which illustrate the paper, has elicited the fact that these were made to appear as much at variance with any known system as possible, consistent with the facts in the case, solely on account of the jealousies which unfortunately environ the electric light business of to-day. If any of the readers of the REVIEW think we cannot draw, bring on a corkscrew and a bottle—of ink—and try us.

The United States people are re-wiring the Palmer House, for both arc and glow lamps. There is quite a stir among the various companies, in a gossipy sort of way, about the possible materialization of the city's proposed plant, but until the city fathers decide to have a plant speculation can be of litle moment. So far nothing has been done more than to ask how much such a plant might cost. After that question is answered, then—if the law makers see fit—comes the order to put one in; and after that will come the iron works, and the devil take the hindmost.

A Pittsburg chap says that the Baltimore and Ohio and Western Union Telegraph Company are about to fuse, and become

"Two fat single gentlemen rolled into one."

He says this because General Superintendent C. A. Tinker and Division Superintendent C. O. Rowe, of the Western Union, came to Pittsburgh and went through the Baltimore and Ohio office on a tour of inspection, and Thomas T. Eckert had done the same identical thing at Baltimore. These movements created considerable stir at Pittsburg, and the reporter got out his patent, double-back-action-interview pump, and went for everybody.

Manager Clark, of the Western Union, was run into a corner, and confessed that negotiations of some sort had been in progress some time, but he didn't know what about, or whether they had culminated in anything. The pump was attached to a Baltimore and Ohio official

Then one of the Chicago members of the "Universal Pumping and Vacuum News Expander's" Association—Chicago Branch—went to General Superintendent Clowry, to see how much that was known to be secret could be forced out of him, and he denied all knowledge of the assumed consolidation. He said that :

"Even now the Western Union is lowering its rates west, in Nebraska, Kansas, Colorado, Utah, and elsewhere as rapidly as is consistent with its ability to do so ; and this is being done in many places where there is no competition at present or likely to be in the near future. The company is pursuing a policy of its own in this regard, encouraging thereby further growth of business by the adoption of rates that can by no means be correctly held as prohibitive. Whatever stock-jobbers might report to aid the present bull movement in the East by the circulation of rumors of combination with, or absorption of, the Baltimore and Ohio, he felt free to say that the Western Union management would not change its policy, and needed no alliance for self-protection."

Wisconsin telegraph companies have paid taxes in that State, as follows :

	1885.	1886.
Western Union,	$5,421.00	$5,212.00
Lancaster & Plattville,		70.00
Chicago & Milwaukee,		132.00
Wisconsin Telephone Co.,		3,324.00

CHICAGO, Dec. 13, 1886.

BOSTON ELECTRICAL NEWS.

The Boston Consolidated street railway petitions for authority to construct, maintain and use railways in Brookline, Cambridge, Somerville and Chelsea. In conversation with the writer, President Powers said in relation to this position that it meant simply an extension of the company's charter by the Legislature, and that before any further move could be made it would be necessary to petition, in the regular way, the city governments of the three cities interested. The charter now gave the company power to operate lines in Boston, part of Brookline, Malden, Medford and Everett. It desired privileges which had been readily granted to other companies. It wanted an extension of the privilege in Brookline, an opportunity to extend into Cambridge and build a depot there, and to lease or build in Somerville and Chelsea. No definite plans had as yet been formed, and, as had already been said, if the Legislature should act favorably on the petition it would then be necessary to go to the several cities and get their permission to do what the company should desire. Mr. Powers gave expression to the opinion that at no distant date electric motors were destined to take the place of horses.

In the annual report of the director of the Harvard Observatory, mention is made of the fact that the time (electric) service and system of telegraphic announcements of astronomical discoveries have been carried on during the past year with regularity and success.

This is the age of electrical progress. In the preface to the Harvard index for 1886-87, we find "for the convenience of that ever large class of students who go to Cambridge fires, the fire alarm numbers have been added."

No. 6 copper wire (B. W. G., *i. e.*, Birmingham wire gauge) is in general use for 2,000 candle-power arc light circuits. For the divided arc, or 1,200 candle-power light, a No. 8 wire is often used. A clear understanding of the difference of the Birmingham, or Stub's wire gauge, and the American, also called Brown & Sharp's, is necessary to enable a purchaser to obtain the size of wire he wants. We heard recently of a purchase of No. 6 wire for an arc circuit. The wire was No. 6, B. & S. (Brown & Sharp's) gauge, of which the diameter is .162 inch. This is almost exactly the same as No. 8 B. W. G. (Birmingham wire gauge), which is .16 inch diameter.

While speaking of wire gauges, it seems desirable that there be some uniformity. However, the English will not adopt the A. W. G., nor the Americans the new British wire gauge. The new gauge in Germany is unlike any of the others. The French use millimeters and decimal parts thereof. We have one way in which we can make evident the size of wire we wish to purchase, and that is to give the diameter in thousandths of an inch. Micrometer calipers, measuring up to 1 inch in thousandths of an inch, so that the reading can be made to tenths of a thousandth, cost less than a wire gauge. Wire gauges are never very accurate, and by wear become quite unreliable, indicating from one to three sizes out of the way, while any wear in a micrometer caliper may be measured and allowed for, supposing that that adjustment could not be made to make the reading of the instrument begin from zero.

We hear that a Boston man has discovered a way to drive a sailboat by blowing air upon the sails, or something more wonderful still, a metallic composition which will cut off magnetic attraction. What have all the old-fogy professors in our colleges and scientific schools been doing these days? Keeley has discovered the principle of "Interatonic dissociation of water by electromagnetically vibrating the constituent molecules." Fink has invented a compound of water, chalk, etc., an annihilator of the co-efficient of μ, and sold the receipt as well as the people who bought. A Mr. Hall has completely upset the professor's notions of natural philosophy. A Boston man has invented a dynamo which gives more than 746 watts per horse-power; another hub man has found a way to utilize at slight expense the electricity of the elements, which ones we are not informed. Still another modern Athenian is trying to prove that a throttling governor is more economical than an automatic cut-off engine; another has been trying to build an engine with a square piston ; the rotary fiend blooms every spring—O bother, etc. Where have the professors been all this time? The metallic composition man has made perpetual motion, or still better the production of motion without expenditure of power. For suppose we allow a piece of iron to be attracted to a magnet, the piece of iron in moving may be made to set a wheel revolving, the magnetic screen is now pushed over the poles of the magnet (this requiring little power). The piece of iron is now pulled easily away from the magnet to be again attracted as soon as the screen is removed. A company is to be formed to introduce this system; capital, $100,000,000. It is rumored that the erection of a new insane asylum is much needed.

Last week I met Sneutzhner, a member of the third house, coming down the State house steps. "Lots of news for you, my boy. Every gas company in the State is petitioning the Legislature for permission to run an electric plant. The worst of it is they don't pay us anything," and here he drew himself up to full height, and posed. I expected every minute he would want to borrow a quarter of me, but he saw I looked hungry and so refrained. "But" he rattled on, "I thought seafaring men disliked the bright glare of the Hell Gate lights." "So they did!" "Well, the Cunard Company have sued the city of Boston." "How's that?" "For putting the 'Harbor Lights' in the Bos'on museum." "Well? anything else," I asked ; "they say Governor Robertson has broken his jaw." "How did he do it?" "Cracking Chestnuts. My boy, when you're older, you'll be wiser." "Stop," said I, "John Goldthwait is putting his carpets up and down continually ; you know him?" "Yes," he replied. "I know him, how is he doing it?" "You see he has an electric elevator in his store so he can put them down when he buys, and up when he sells, ta, ta."

The Hartford, Conn., Electric Light Company, have purchased a 45 light, 6 ampere Ball machine, furnished by the Ball Electric Light Company of England.

It is said that a fashionable adjunct to the library in a fashionable home is a telephone and magneto apparatus to give the impression that the inhabitants are connected with the central station. If a friend wants to use it, it is just out of order. It is a part of the finish of the room.

EXECUTIVE COMMITTEE NATIONAL ELECTRIC LIGHT ASSOCIATION,
2011 JOHNSTON STREET,
PHILADELPHIA, Dec. 11th, 1886.

Geo. Worthington, Esq., Editor of the Review.

DEAR SIR: It is designed to make the meeting of the National Electric Light Association, to be held in Philadelphia in February, the most interesting in its history.

The place and date will be determined by the Executive Committee, which meets in Philadelphia at the Hotel Lafayette, December 21st, at 3 o'clock P. M.

Although the needs of the association can be met by the very small dues of $10 per annum, the officers of the association are somewhat embarrassed by eighty-two out of the two hundred members being in arrears for the year 1886. It is hoped, however, when they receive a reminder they will remit forthwith.

The Executive Committee hope to make arrangements with the Hotel Lafayette, the most popular and centrally-located hotel in Philadelphia, for entertaining the members in February. Visitors need no further guarantee of the creature comforts being provided for. If they are present, an interesting and profitable meeting is assured.

Yours very truly,
A. J. DE CAMP,
Secretary Executive Committee.

Telephonic News

⁂ The Colorado Telephone Company is building a line to connect Canon City wtth Pueblo and Denver.

⁂ The Amagansett Telephone and Telegraph Company, of East Hampton, has been incorporated, with $2,500 capital. Its trustees are J. Mason Schellinger, John B. Strong, Benjamin H. Terry, George C. Hand and Joshua B. Edwards.

⁂ Jeff Chandler of government counsel in the Bell telephone case, said recently that the government did not propose to appeal the case to the Supreme Court, because it would be impossible to obtain action for at least two years, but will institute suit against the company in Boston as soon as possible. Perhaps Jeff don't know everything.

⁂ According to the *Figaro*, a young lady committed suicide at Brussels the other day, under very extraordinary circumstances Having heard of the unfaithfulness of her lover, she called him up at his place of business by telephone, and asked him if it was true that he was going to marry Mdlle. ——? He replied that it was quite true. "Then good bye, for ever," were the next words that reached his ears, followed by the report of a pistol. The poor girl had shot herself.

⁂ Abe Franks who has been employed as a telephone repairer, while working on the line between Leavenworth and St. Mary's Academy was frightfully injured last week. Mr. Franks had climbed to the top of one of the poles and was sitting with one leg hanging over the cross arm, when suddenly the pole which was twenty-five feet high broke, and he was carried to the ground by its fall. His left arm was fractured, and also the bones of his left hand to such an extent that the bone protruded.

⁂ The Metropolitan Telephone Company have applied to the Subway Commissioners for permission to erect a new line of poles in Sixth avenue, from Fifty-eighth street to Yonkers. There would be 438 poles, according to the plans, and a diminution of fifty-eight poles from the existing number. The poles are wanted for a long distance telephone line between this city and Boston. The line has been built between Boston and Yonkers, but the poles for the rest of the way are not strong enough to carry the heavy wires required in addition to their present burden. The application was referred to Commissioner Hess. A similar line has been established between New York and Philadelphia.

⁂ Operations on the Subway for electrical wires, now being built in this city, have been stopped owing to the condition of the weather. Col. Kearney, the engineer, of the commission, reported in favor of such a delay at a meeting held last week. He said that there were six inches of frost in the ground, which would not only make excavations difficult, but would also render it almost impossible to restore the pavement to proper condition after the conduits were laid. Further, he said, the Department of Public Works was very chary about granting permits to open the streets in winter. The commissioners discussed his report at some length. All expressed regret that there should be any further delay in removing the poles and wires from the street, but the final vote directing the cessation of work was unanimous. Whenever the weather moderates for a few days the work will be resumed.

The routes affected are through Fifty-eighth street, from Sixth avenue to the East river; through Spring street, from Broadway to the North River, and through 128th street, from Third to Fourth avenue and thence through Fourth avenue to the Harlem river. The last two routes are the most important.

⁂ Justice Wilson, of Toronto, Ont., has delivered judgment on the Bell telephone application for an injunction restraining the Belleville Electric Company from stringing wires on its own poles so close to the telephone wires as to impede telephone communication by the humming of the electric light machinery. The injunction was granted with costs against the Electric Light Company, and Justice Wilson decided that the electric light wires must be strung at a distance from the telephone wires sufficient to ensure their freedom from disturbance.

⁂ "Hello!" "Hello!" "Is this the gas company's office?" "Yes; what is it?" "When do the entries for the spring races open?" "We don't know anything about the spring races. This is the gas office." "Correct—keep off there, central. Can anyone round there tell?" "Why, what's going on?" "Oh, nothing particular. I have a gas meter down here I would like to enter, that is all."

⁂ The Hudson River Telephone Company at Albany, N. Y., yesterday received by express from New York city their new improved switch board. It is what is called the "multiple" board, and is ahead of the old style switchboard in every respect. By its use the whole system of switching will be changed. Each subscriber will have a number, and names will no longer be used. The disconnection will be automatically made in the central office, which will prevent operators from interrupting and asking "are you through?" which is necessary under the present system. The new system will be in operation by January 1st.

Indiana Business Men Waking Up.

Now that the Wallace and every other telephone company that proposed to provide accommodations for Indianapolis have been enjoined from operating, there seems to be no good reason why the city council's action in preventing the Central Union from extending its lines, should stand. Certain persons are now using the telephone and others are denied its use, because of the inability of the company to extend its lines. The present telephone law has been successfully evaded, and will probably be repealed this winter. At least the Bell Company are preparing to insist upon a repeal, and the question will certainly come up for consideration. A gentleman, who ought to know, says that the Central Union has made more money since the present toll system was put into operation than under the per annum tax. Some patrons fall below $5 per month, but the bills of others so largely exceed this rate that the general average is brought considerably above $60 per annum for each instrument in use. The people begin to realize the fact that the Central Union Company have always done the best they could afford to with them, and the business men can no longer be worked by blatherskite politicians or wild cat telephone shysters for their sinuous and meretricious purposes.

New Wire Splicer.

A handy tool for splicing telegraph, telephone and electric light wires is owned by Messrs. Pearson & Ward, of Lowell, Mass. The idea was to combine a splicer, flat nose pliers and cutting off nippers in one single tool. The instrument simply consists of two jaws provided with handles. Between these jaws, when closed, is a hole large enough to receive the wires to be spliced, the passage being made smaller at one end. From the passage extends a slot in which is to be placed the end of a bent wire. The wires to be spliced are held in an ordinary hand vise, and the short end bent at right angles to the other wire. The splicer is applied so that the short end lies in the slot, the wire around which it is to be wound passing through the hole. Upon rotating the splicer about one wire as an axis, the other is wound upon it. The other end of the splice is made by reversing the wires in the vise and proceeding as before.

It is very simple in construction, and can be combined with the ordinary flat nose pliers without adding to the weight, or interfering with the uses to which such instruments are ordinarily applied. It is absolutely sure in its action, cannot slip while being used, and can be employed more expeditiously and with less trouble than any other splicer. By increasing the size, any sized wire can be spliced. It can be manufactured at a very low cost.

The Connection Between the Fire Department and the New York & New Jersey Telephone Company — Statements of William D. Sargent, James A. Murtha, Thomas F. Nevins, R. W. Raymond and Others.

The joint committee on Fire Department and Law of the Common Council met last week to consider the petition of D. W. Northup and others that the erection of poles in the streets and the stringing of wires upon them may be stopped, and that the provisions of the Underground Wire law may be carried into effect in the city. Among those present at the meeting were Mayor Whitney, Thomas F. Nevins, Chief Engineer of the Fire Department; James A. Murtha, Deputy Commissioner of City Works; R. W. Raymond, Electrical Subway Commissioner; Robert Van Buren, Chief Engineer of City Works; Prescott L. Watson, Superintendent of Fire Telegraph; Frank Mason, Superintendent of Police Telegraph; William D. Sergeant, General Manager of the New York & New Jersey Telephone Company; William G. Magowan, Manager of the Western Union Telegraph Company; Henry Hentz, the Rev. Dr. Chamberlain, Classon Avenue Presbyterian Church; D. A. Fowler, H. A. Pouch and C. A. Haviland.

Alderman Coffey presided, and the first speaker was C. A. Haviland, who said it had been declared through the public prints that he should be sworn in his statements relating to the matter under discussion. That he did not intend to do, but he would present affidavits from prominent people who felt aggrieved and which he thought would answer the same purpose. He read and handed to the committee the affidavits of Alfred J. Pouch, Edward W. Haviland, Joseph G. Underhill, W. H. Tunison, E. W. Haviland and C. A. Haviland, protesting against the erection of poles in the neighborhood where they reside. He then asked Deputy Commission Murtha whether he had not granted a permit to the Fire Commissioner to erect poles when it was understood that the New York and New Jersey Telephone Company was to share the privileges by stringing its wires on them.

Mr. Murtha—No, sir. I knew of no agreement between the telephone company and the Fire Department. The question came up on the right of the Subway Commission to grant permission to a company to erect poles in sparsely settled portions of the city. In regard to the Fire Department, the City Works Commissioner has no option but to grant permits when they are applied for; but when a telephone or telegraph company applies, the Commissioner claims the right to investigate and see whether the poles are to be put up in sparsely settled portions of the city or not. If they are not he will not grant the permit.

Mr. Sargent, of the New York and New Jersey Telephone Company, stated that a verbal agreement had been entered into between the Fire Department and the telephone company whereby the latter was to erect poles for the former, and in return have the privilege of stringing its wires on them.

Alderman Corwin—If the Fire Department removes the wires to-morrow, to whom do the poles belong?

Mr. Sargent replied that they belonged to the city, but he had no authority to say so. The company was entirely in the hands of the Subway Commission.

Alderman Corwin—What we want to get at is as to the ownership of the poles.

Mr. Sargent—The company never questioned the ownership of those poles as being in the Fire Department. The poles are the city's property under any circumstances They were erected at the company's expense under a permit given to the Fire Department. We erected many poles, however, under permits granted to the telephone company; in the other case we acted as agents of the Fire Department. By the arrangement that was made the city and the telephone company were mutually benefited.

Alderman Corwin—Does your company expect to receive anything from the city for putting up any poles for the Fire Department?

Mr. Sargent—No, sir. When the last lot of poles were to be erected for the Fire Department, we agreed to put them up and have the right of way upon them for $2,000, but the proposition has not been agreed to. On Halsey street the poles belong to the telephone company. The Fire Department wires have the right of way on them and our other poles in the city.

Mr. D. A. Fowler asked whether the company received permission from the Subway Commission to string their wires on the Fire Department poles, and Mr. Sargent answered "No." He also said that no permission was received from the Subway Commission to erect poles on Classon avenue. The telephone company paid a large amount of taxes on the poles it owned and on all its wires, a great deal more he thought than it ought to pay. Everything had been done in a lawful manner, as far as his knowledge went.

In reply to a question of Chairman Coffey, Chief Nevins said that Commissioner Ennis would ask for an appropriation to have the fire department wires put underground. The telephone company for a number of years past had been serving the fire department, instead of the department serving the telephone company. Altogether the company had put up for the fire department about $30,000 worth of poles. To show the value of the fire alarm box system, Mr. Nevins said that in 1885, with 139 alarm boxes, the average loss per fire was $827; in 1884, with 87 boxes, the average loss was $1,483, while this year, with 270 boxes in use, the average loss was only $601. In 1872 there were no boxes and the average loss per fire was $5,400. The fire department has now thirty boxes which could not be put in place because the erection of poles had been stopped. The city now owned 1,882 of the poles in the streets.

Aldermen Fanning and Corwin spoke vigorously on behalf of the petitioners, the latter suggesting to the Mayor that as 35 foot poles were of sufficient length for the use of the fire department, such be erected and the telephone people be compelled to lay their wires under ground Alderman Fanning cited instances where he had been deceived by men planting poles, and finished by saying that in his opinion there was underhand work in the matter, and the laws should be observed to the letter.

After some remarks by the Rev. Dr. Chamberlain and Mr. Henry Hentz, Professor Raymond, of the Subway Commission, said that he and his associates were preparing a report to the Mayor which would cover the whole subject. He did not believe the telephone company had put up a single wire on a pole without a permit from the Subway Commission. In the city were 275 miles of fire wire, and to put it all underground would cost $300,000. The commission would recommend in their report the gradual burying all of the fire department wires. At the present time there were 13½ miles of conduit laid underground, and in the advances it has made in this great experiment Brooklyn was ahead of any city of the world. The conduits now in the streets would accommodate 13,000 or 14 000 miles of wire.

Chairman Coffey claimed, on reading the law, which says that the work of burying the wires in the streets shall be done under the control of the local authorities, that "local authorities" meant the Common Council.

Professor Raymond said the commission did not so understand the law; the plans for the conduit had therefore been submitted to the City Works Commissioner, Mr. Fleeman, and not to the Board of Aldermen. This brought the meeting to a close.

Telegraphing To and From Moving Trains.

One day last week, a gentleman representing the ELECTRICAL REVIEW, had the pleasure of accompanying the President and some of the prominent directors and officials of the Phelps Induction Telegraph Company, on an inspection trip of the first section, consisting of fifty eight miles of the Phelps' Induction Telegraph system placed on the Lehigh Valley Railroad, between Perth Junction and Easton.

It was an exceedingly disagreeable day, damp snow from eight to ten inches in depth covering the surface of the ground. A large number of telegrams were sent to this city and other parts of the United States from the rapidly moving train; and also many received. The following message was received by the editor of this paper:

TRAIN NO. 5, VIA FLEM. JUNCTION, N. Y.
George Worthington, Electrical Review, 23 Park Row, New York:

Sent from moving train on Lehigh Valley Railroad; going fifty miles per hour. Working splendid. H. D. HALL.

Messages were sent and received with ease and facility.

To illustrate the instantaneous connection which can be had with the outside world from the moving train, by this system of telegraphy, a question was asked through the operator on the train, of a gentlemen at the key situated at the office of the Lehigh Valley Railroad, No. 235, Broadway; the train, at the time that the question was asked, was some 10 miles this side of Easton and moving rapidly, at about 50 miles an hour; scarcely a half minute ensued, after the question was asked, before the answer was promptly received.

The method employed by the Phelps Induction Telegraph Company, in placing its system upon this road, is somewhat different from the method used upon the plant that has been in operation for some time past upon the branch of the N. Y., N. H. and H. R.R. It consists of an insulated copper wire, placed between the fish-bar and the rail, the fish-bars upon this road being of a somewhat peculiar construction and hollow, affording therefore ample space for the wire to be run between the fish-bar and the rail; the wire is therefore perfectly protected from injury by the rail, one wire being used for both "up" and "down" tracks. The coil on the car is not placed in an iron pipe underneath the car, as in previous descriptions, but the upper portion is attached upon the roof of the car, and the under portion underneath the flooring of the car.

The instruments used are the same as employed by the Phelps Company on the N Y. & N. H. R. R, viz., telephone receiver, buzzer or vibrator, sending key and battery.

The inspection proved a perfect success, and telegraph Superintendent of the L. V. R. R., Mr. J. W. Lattig, was very much pleased as well as the officials of the Phelps Company. A number of messages were sent from the train by the passengers.

We understand that the Phelps Company are now about equipping nine cars for actual use on the Lehigh Valley Railroad, and that they also will extend the line beyond Easton, as far as Mauch Chunk. They, as well as the Lehigh Valley Railroad Company, are to be congratulated upon this practical success of railway telegraphy. We also learn that the N. Y., N. H. & H. R. R., after carefully testing the system practically upon their Harlem Branch road for the past 18 months, have just closed a contract with the Phelps Company for placing the system upon their main line from New York to Springfield, Mass.

* * New electric railways have been constructed in Denison, Texas; Fairmount Park, Philadelphia, and Port Huron, Mich.

* * The Boston and Lowell Railroad is experimenting, between the West Somerville and Arlington stations, with an ingenious and novel signal and danger alarm for use previous to its general adoption, provided its operation is satisfactory. The invention consists of a generator of electricity, placed on the engine, and connected with the rails by a suitable device to convey the electric current from the generator. In the cab of the engine is a gong, or target, which will ring a safety signal, if the tracks are all clear, the rails in place and not broken at any place, the switches and draw-bridges all closed and locked, when a train is entering upon a section of the road. Should there be any displacement or obstruction upon the track, the gong will sound a danger signal, and a target will appear before the engineer, showing the words "danger slip," and the target will remain at danger until the trouble is removed, or until the entrance is made on the next section, when it returns to safety. At no time can an engineer approach danger except at a distance in which he can stop his train, or bring it under perfect control. Another new and important feature in the invention is that all switches and drawbridges are locked by the train immediately upon entering the section where they exist, and they cannot be opened until the train has passed.

Battery Work.

To strip gold from a gold-gilt article, and to recover the gold, put the article in strong nitric acid mixed with a little common salt till the gold is removed. The moment the gold is stripped remove the article then evaporate the solution to dryness, and melt the residuum with potash or soda. The quality is improved by melting three or four times, adding a little nitric each time. Roll out to the required thickness for anode. To strip and recover the silver from plated articles, get an enameled pot and put strong sulphuric acid and a little nitrate of potash (saltpeter) into it. Place the pot on the fire and boil, then immerse the articles in the solution till the silver is stripped. Add nitrate of potash till the silver is quite off. Then dilute the solution very much with cold water, and place a sheet of zinc in it. This will throw down the silver in a metallic state. When it is all thrown down, pour off the liquid and wash the silver three or four times, then melt and roll out for anode. It will be seen that great care is required in stripping gold or silver, because if the article is kept in the solutions a moment after the gold or silver is stripped, the solutions become deteriorated with the base metal below; but of course this can easily be rectified by refining in the ordinary way if a chemically pure anode of gold or silver is wanted. The question as to whether a dynamo or a battery is best for plating cannot be definitely answered. It really depends on circumstances. Operations on a large scale are mostly performed with the dynamo; but the battery does equally well if powerful enough for the work on hand.—*English Mechanic.*

The Subway Commissioners to Get Their Salaries at Last.

The Electric Subway Commissioners of New York City, after serving for nearly 17 months without receiving any pay, are at last to get their salaries for 15 months of that time in one lump. The money to pay them is assessed by the Controller under the provisions of the law upon the electric companies which are to use the underground wires, and the failure to pay the salaries quarterly has been due to the difficulty encountered in collecting the money. Western Union, when the commission was first appointed, claimed that it was an unconstitutional body, and paid no attention to the demand made upon it for its proportionate share of the expenses of the commission. The result of this was that the smaller companies held back, waiting for the success or failure of the large corporation in its efforts to ignore the commission. The Metropolitan Telephone Company was the first to bow to the inevitable and send a check to the Controller covering its assessment. This broke the ice, so to speak, and Western Union followed suit recently, thus practically abandoning its opposition to the commission. Of course when these two large corporations stepped to the Captain's office and settled there was nothing for the smaller companies to do but to pay their assessments, and they are doing this very promptly now.

All the money due from the different companies has not yet been collected, but the Controller has enough on hand to begin the payment of back salaries, and yesterday Deputy Controller C. R. Hale forwarded to Commissioner Moss, Secretary of the Board, receipts for the salaries of himself, Commissioners Hess, Loew, and Flower, with a notification that as soon as they were returned to Treasurer Fitzgerald properly signed, and accompanied by the proof of the appointment of the Commissioners to office, checks would be forwarded covering the salary due to each. In the case of the late Charles E. Loew, the receipt will have to be signed by his Executors. The board has been organized since July 8, 1885, and the salary for Commissioners Moss and Hess is for five quarters from that date. No step has been taken yet for the payment of clerks, engineers, experts, counsel, and the other expenses incurred by the commission, but this will be attended to as soon as the money is collected.

..... A Leipzig inventor has devised an extremely dramatic mode of execution for criminals, which possesses the additional advantage of being painless. The machinery consists of a platform nine meters square, approached by five steps. In the center of the platform is a chair for the condemned man. Behind it stands a figure of Justice, holding a pair of scales in her left hand, the scales being movable. Under the platform is placed an electric battery, from which wires pass through the legs of the chair into the seat and back, terminating in platinum plates. If the patient objects to seating himself in the chair, he is simply tied in. After the sentence has been read, the executioner takes a stick, breaks it, and places the pieces in one of the justice's scales. This descends, puts the battery in motion and—finis! Death is instantaneous and painless. The machine was tried on animals in the presence of a large company of invited guests and pronounced a success. In order to make this figure of justice really effective, invitations will have to be issued to executions, otherwise the battery might be worked without any such dramatic accessories as the statue with her scales. But art is a potent factor even in useful inventions, nowadays, and this is, no doubt, regarded as the height of art in its way.

.... The President's message contains 16,250 words. It required four operators at the Western Union office in Pittsburgh just three hours and a half to receive the message, making about 1,200 words an hour. The same operators both received and wrote out on manifold paper at the same time their respective "takes" of the message. The document was received in Pittsburgh over the New York circuit, and from there repeated to Cincinnati, and from that point it was distributed to other points west. From Washington the message was first sent to New York, and thence to all points north and west. Within the last year the Associated Press office of Pittsburgh has accomplished a feat in telegraphy unequaled by any other office in the United States. Two operators, F. B. Wilhams and Harry Orr, received daily for one month 25,000 words of press dispatches without once opening the keys during each day.

*** A suit of peculiar interest to property owners was begun in Justice Martin's court at Columbus, Ohio, Dec. 3d, by General John Beatty, president of the Citizens' Savings bank, against the Central Union Telephone Company. His object is to secure the removal of certain wires that are strung to supports on and over the bank building on North High street. The ground of the general's complaint is that the wires have become a nuisance and have greatly damaged the building from the number of attachments that have been made to it and the fact that employes of the telephone company are constantly climbing over and breaking the roof, rendering repairs necessary.

TELEGRAPHIC

.... The report of the Western Union Telegraph Company for the quarter ending December 31st estimates that the net revenues will be $1,000,000. The executive committee recommends that no dividend be declared.

.... The German war office having decided that all sub-officers must learn telegraphy, 100 officers selected from the Berlin garrison and 100 from the garrison at Strasburg and Metz have begun a course of tuition.

.... A movement has, it is stated, been set on foot in Italy towards erecting in one of the principal towns an electrical crematorium. In this edifice the corpses will be instantly consumed by means of an intense heat caused by electricity. Various European cremation societies are reported to have dispatched representatives to Italy to make inquiries as to the feasibility of the scheme, which, it is expected, will if successful, soon replace the more elaborate methods now generally adopted.

.... The Western Union Telegraph Co. have for years been furnishing the Chicago Board of Trade with market reports from the commercial centers and ticker service on the floor for the use of members, making an exorbitant charge therefor. The board recently made a contract with the Commercial Telegram Company, of New York and Chicago, for this service. Saturday the Western Union tickers were removed from the floor, and the Commercial tickers substited

.... The Baltimore and Ohio Telegraph Co. has completed its connection with the Canada Pacific Railway Telegraph lines, thus adding another large and important territory to its system. This connection establishes direct communication between all points on the Baltimore and Ohio system in the United States, and all points on the Canadian Pacific system from Quebec to British Columbia on the Pacific coast. It is expected the line from Vancouver to San Francisco will be completed within thirty days.

.... Advices from New Zealand by the Australia give the following particulars of the proposed Pacific cable: The company has been already formed. The estimated cost is £2,000,000; total annual subsidy, £100,000; all the lines of the Canadian Government to be used free; to be constructed in the following sections: The first will be from Brisbane, or some part of New South Wales, to the North Cape of New Zealand, a distance of 1,300 knots; the second from the North Cape to Fiji, 1,240 knots; the third to Fanning Island, 2,270 knots; the fourth to one of the Sandwich Islands, 1,269 knots; the fifth to Vancouver Island, 2,730 knots, and the sixth across the island and the Straits of Georgia to Vancouver City, on the Pacific Coast, the terminus of the Canadian Pacific Railway, 100 miles. Total length, 8,000 miles. It is expected that the Imperial Government will find half the subsidy, the Australian Colonies the other half.

.... The Baltimore and Ohio Railroad and Telegraph Company have completed arrangements to extend its wires and open an office at Lockport, N. Y. In order to induce the company to locate an office in that city it was necessary to sell $2,500 worth of stock books. The sale of the books was placed in the hands of L. J. McParlin, and the requisite amount has been raised or nearly so. The connection for Lockport will be made at Bergholtz, where the main line from Buffalo to Toronto, Ont., passes. The poles for the extension are in Buffalo, and the work will be commenced immediately.

A first-class American district service system will be put in operation, and call bells located at hotels, factories and business places. It is expected that the new line will be built by the 15th of this month.

It is understood that the main office will be under the management of L. J. McParlin.

Electrical Welding.

At the meeting of the Society of Arts, Dec 9, Prof. Elihu Thomson, of the Thomson-Houston Electric Light Company, read a paper on the subject of the "New Art of Electric Welding." The apparatus was shown in working order. One of the largest lecture rooms in the rear of the new building of the Massachusetts Institute of Technology was filled by about five hundred interested spectators. While passing through the hallway on the way to the lecture room one might see a number of insulated wires to which was attached a placard, "Don't handle. Dangerous; Alternating Currents." After the reading of the records of the last meeting, and the election to membership of a number of persons, Prof. Chas. R. Cross, Prof. of Physics in the Institute and presiding on this occasion, introduced Prof. Thomson, by alluding to the good fortune of the society in the past in being the first body to whom some of the most wonderful and far-reaching inventions of the last fifteen years had been explained and illustrated. Prominent among such was the "speaking" telephone, the invention of Alexander Graham Bell. Passing from the telephone where currents of exceedingly small quantity are employed to subject before the meeting, we find enormous currents used, perhaps larger than ever before. From what has already been done, we may hope that in the line of industrial progress, Prof. Thomson's invention may accomplish what Prof. Bell's has done for social and commercial advancement.

Prof. Thomson then read a paper the substance of which we give.

In the past 15 years there has been a great expansion of the uses of electricity in the arts, the telephone, transmission of electric current for light and power. Of these, perhaps, in the future the transmission of power will be the most important. The energy of an electric current may produce mass motion (transmission of power), wave motion (telephony), light, chemical decomposition, and heat motion which usually appears with the other transformations. The employment of heat generated by an electric current for the warming of buildings does not seem to be practicable. The steam engine is so poor a converter of heat motion into mass motion that the efficiency of such a system would be very low. But in the arts where the amount of heat needed is small, or for sudden effects, or for high temperatures which are limited only by the vaporizing point of carbon heat produced by an electric current may be advantageously employed. An example of its successful employment is the Cowles electric furnace in which the most refractory ores are reduced and metallic aluminum, boron, and silicon obtained directly from their compounds. In the dictionary definition of welding mention is made of the fact that tortoise shell could be easily welded. The lecturer remarked that he did not intend to experiment on tortoise shell.

By the processes in common use it is difficult if not impossible in many cases to weld together different metals. Two pieces of the same kind of cast iron, zinc, tin, brass, and especially copper have not been easily welded. By means of electricity they may be easily united. Iron, steel, and platinum which have been the metals hitherto most easily welded, are by the new process still more readily united.

To attempt by the new process to weld unlike metals may fail on account of a great difference of their temperatures of softening, or of their specific electrical and heat conducting capacities.

The method is to forcibly press together the two pieces to be united while passing a large current.

Uses. The joining into one continuous length of short pieces of copper and iron wire. In the factory of the Thomson-Houston Company wires are joined by this method for making joints in all copper and iron wire used. The largest copper rod yet welded is a little less than ½ in. diameter, requiring about 20,000 amperes. The same current will weld iron 1 in. diameter, the difference in the size of the two metals being due to the greater resistance and lesser conductivity of iron. Specimens of various sizes, shapes and materials were here shown; cast iron, steel cast iron in one piece; steel, brass, copper also in one piece; copper rod bent at joint after welding. Brazing can be done successfully by putting brass on a hot joint while current is passing. The smallest wires yet united by welding by this process have been $\frac{1}{80}$ in. diameter.

Other specimens were butt welding of metal tubes, iron, brass, and copper, and lead. The iron pipes were hammered during the welding. Long lengths of cast or wrought iron pipe may be used in streets, a few bends being put in to allow for expansion and contraction. For making long lengths of pipes for coils of pipe for boilers and for other purposes this method will be largely used, also for endless bands for saws, wheel tires, tub barrel and tank hoops, iron and steel links. There were shown copper ring, cast iron ring, brass ring, iron barrel hoop. In case a tire is too large the heating and upsetting of one or two places considerably shortens it, wrought iron links, iron ring made of 9 pieces, which was twisted severely by the lecturer without the giving way of a single joint. There will be a wide one for the method in the repair of tools, and parts of machines such as the following, some of which are put to practical use in the Thomson-Houston factory; lengthening of screws, taps, augers, lag screw bolts, by cutting off the shank and welding in a piece of iron or steel. A tool may be shortened by cutting out pieces and welding together. Steel points are welded to cast iron bodies of lathe tools; shafts may be lengthened. The alignment of lengthening depends on the accuracy of the holding devices. Specimens here shown drill of 3 pieces, long lag screw from a short one by lengthening, tap lengthened in same way, worn out lathe center with twist drill welded on, bars united to sheets of metal and washers. A carpenter's auger lengthened by this process was broken after being twisted two turns, the weld still being sound. For jewellers as well as for others this process may be made useful.

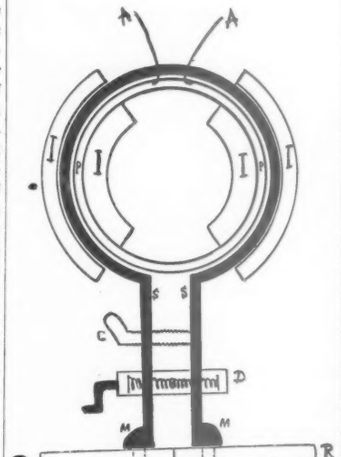

FIG. II.

Less fuel is required by the electric method of welding on account of the small time required for the operation and the application of the heat locally, and the small losses from radiation and conduction. The time required being so short more joints may be made in the same time by comparatively unskilled labor.

In arc light circuits a current of 10 amperes, with an electrical pressure of 2,500 volts, is not infrequently employed. In incandescent lighting a current of 250 amperes, at an electrical pressure or electromotive force of 100 volts, would represent the same amount of electrical energy. In welding wire enormous currents are employed. Fifty thousand amperes, at an electrical pressure of ½ volt, would represent exactly the same amount of electrical energy. This amount of current would probably weld steel 1½ inches in diameter in less than two minutes. Electric lights demand a continuous application of power, while the welding, for instance, of a 1½-inch piece of steel would require 85 horse-power for only one minute, the same power being required continuously to operate 40 to 45 arc lights. The means for obtaining sufficiently large currents are two—storage batteries and alternate current machines connected with transformers.

A secondary or storage battery of very large surface, and consequently of low resistance, is put in an arc light circuit and charge from the terminals of the cells; large-sized conductors connected with such binding posts as are shown in Figs. 1 and 2. The battery gives out its heat so fast that most of the energy is developed in the external circuit or at the point to be welded. The battery, however, is not portable; the liquids are easily spilled, a long time is required for charging, and it is not so manageable as the induction coil or transformer. The coil,

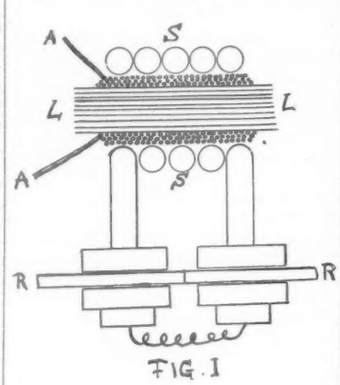

FIG. I

Fig. 1, is composed of a bundle of fine iron wires *L L*, around which are wound a number of layers of comparatively fine wire connected by the terminals *A A* to a source of alternating currents, a dynamo in this case giving 50 to 100 alternations per second. The length of the iron core is 12 inches, the diameter about 1¼ inches. The secondary coil *S S* represented in the diagrams as composed of 5 turns of large copper wire in the smaller instrument shown composed of 64 No. 10 Brown & Sharp's Gauge copper wires wound in parallel eight times around the primary. The ends were bolted to copper plates upon which the clamps are placed, one of which slides by an adjustable spring shown at the bottom of the diagram. By means of a cam the clamps may be separated to any extent. It takes only a few seconds to place the pieces of metal to be welded in the clamps. The iron core on which the primary circuit is wound direct may be pulled in and out. The power of the currents induced in the secondary coil is thus varied and adapted to any sized piece of forging. The resistance of the secondary coil is .00015 ohms.

In the transformer or induction coil, illustrated in fig. 2, the primary coil *P P* is a ring 12 inches in diameter, 2½ inches wide, and ¾ inches thick of many turns of insulated copper wire. The ends *A A* of this coil are connected with the alternating dynamo, and alternating currents thus pass through the wire of the primary coil. The secondary coil is a single heavy bar of copper bent to make one turn outside of the primary coil. The secondary is represented by the heavy black ring, the terminals of which *S S* are bent out to a parallel position and connected to massive screw clamps, *M M*. The secondary coil is shaped like a jewsharp. The parallel portions of this midway between *S* and *M* are made so that the clamp terminal *M* at the right may be moved. The screw *C* is used to force the terminals apart, the bars to be welded *R R* are clamped in position, the clamp *C* is unscrewed, and the tension of the spring *D* is adjusted by the screw attached to it. The pressure of the spring gives good contact of the bars *R R*. The primary and secondary coils are now wound around with an endless coil of iron wire *I I I I*. The iron wire does not touch the primary or secondary coils, but is wound on a sheet iron casing, the secondary coil thereby being free. The resistance of the secondary coil is .00003, and under the influence of a good primary current gives an electro motive force of two volts; less, however, is used in most cases. There is a small percentage of loss in the transformation, a current of 20 amperes and 600 volts in the primary circuit gives in the secondary circuit nearly 1 volt and 12,000 amperes. To generate the alternating current an inexpensive dynamo is used weighing 500 lbs., absorbing 25 horse-power at 1800 revolutions per minute. There are 10 lbs. of copper wire on the armature, and 40 lbs. on the field magnets. The large output from so small a machine without destruction comes from the fact that the machine gives current only for short intervals. There are suitable switches to stop the flow of current when the weld is complete. The primary circuit may be cut or the resistance in the circuit of the field magnets of the dynamo may be varied, a method employed in the present case. To prevent overheating the primary coil of the machine illustrated in Fig. 1 may be pulled out to any extent, or resistance may be added to the primary circuit or the strength of the field magnets of the dynamo varied as described above.

The ends of the pieces to be welded are brightened, and are allowed to project a little beyond the clamps, when in position. A flux of some kind is now often put on the joint—powdered borax for metals that have a high melting point; chloride of zinc, rosin or tallow for lead, zinc, and metals which have a low melting point. The current is now turned on, the ends of the rod become red, then white hot, and at the point of fusion soften; the tension of the spring causes the joint to become upset or thickened. The current is shut off, the clamps unloosened, and the bar with the weld still red hot, may be removed. Of course, many metals do not require even a red heat for fusion. In uniting a large to a small piece, the end of the large piece is first turned down to the size of the smaller. Sometimes the joints are hammered while in the clamps. It is probable that the result is caused by heat alone, though some electrical action may play a part. One circumstance tends to produce uniform heating of the abutting bars. Suppose one part of the surfaces is in much better contact than the rest. The larger part of the current will therefore flow in the path of least resistance. This part becomes hot, its resistance increases in consequence, and the current is to a large degree diverted to the colder portions of the joint, until the whole of the abutting surfaces are equally heated. There is no reason why cheap water power may not set in motion dynamos generating alternate currents of high electromotive force. Such currents may be transmitted with little loss over long distances, and by suitable transformers changed into currents suitable for welding. Accurate tests are to be made at once of the strength of the welds produced by this process. All practical tests applied thus far show that the joint is fully as strong as any other part. A lag screw, a portion in the center of which was cut out, and the ends rather poorly welded without expansion of the joint, when turned into hard wood broke below the weld; the break was sound. A penknife was shown, the two new blades of which had been welded to stumps projecting ⅛ inch, without removing them from the tortoise shell handle, which was not welded by the operation. In another knife a new blade, welded on by this process, was broken, but not at the weld.

The working of the apparatus was now exhibited. Two pieces of iron wire about $\frac{1}{16}$ in. diameter were welded with the smaller induction coil. The pieces in position, Professor Thomson stood watching the machine one hand on the rheostat. The audience sat breathless. A movement of the switch and in less than 3 seconds the junction of the pieces of wire was white hot and the weld

complete. Loud and long was the applause that followed. The current shut off and the clamps loosened, Professor Thomson bent the wire making two twists without affecting the weld. The welding of brass was next shown, rods about ¼ in. diameter being shown. There is more difficulty with the manipulation of brass on account of the oxydation of the zinc contained in it. Twice from a too sudden increase of the current there was a snap, and liquid metal was thrown out from the joint. While working on the brass a whirring sound was heard (while the current is flowing in the coil there is always a peculiar sound), and Professor Thomson remarked that it sounded as if the belt had slipped off, and such proved to be the case.

A weld in small sized copper rod was now made, and it was unaffected by severe twisting.

Connections were now made with the larger apparatus, of which Fig. 2 is a horizontal section. Mild steel rods ½ in. diameter were united borax being used as flux and placed on the rods after they were placed in position. The joint during the passage of the current was very bright. In operating on some brass, the shafting alluded to above occurred once. The belt transmitted the power slipped. While the metals were cold, the resistance of the junction of the two pieces was low, when however, the temperature rose the resistance increased, less current flowed, and the dynamo speeded, as the belt did not then slip, and an excess of current was caused. Notwithstanding this difficulty the union of the brass was successfully accomplished.

Copper ⅜ in. diameter was next united. A copper rod $\frac{5}{16}$ in. diameter and about 10 in. long was bent into a circular form and clamped. To show the power of the apparatus the current was turned on and the copper maintained at a red heat. It could have been easily melted as the limit of power of the apparatus was not approached.

Professor Cross now came forward and said that while ten years ago they first heard the music of the telephone they now heard the music of the jewsharp [referring to the heavy copper secondary coil in Fig. 2]. After adjournment the greater portion of the audience remained to inspect the specimens and apparatus, and great interest was shown in what seemed to be an entirely new process, the applications of which were many and valuable.

The dynamo used looked from a distance as if of the later Edison type, so short and heavy were the cores of the field magnets. On examination the armature was found to be of the Siemens one-coil type, the two ends being attached to a commutator such as are used in ordinary direct-current machines. Brushes resting on this commutator supplied the field of the machine with direct current. Just beyond this commutator there were two rings insulated from each other and the machine, to which rings the two ends of the armature coil were connected, one to each ring. A brush pressed on each ring. These connected the alternating currents used in the experiments above described.

Electric Bells on Ferryboats.

The Pennsylvania Railroad Company has introduced a new appliance upon one of its ferryboats that ensures greater safety to the traveling public. For the past few weeks experiments have been made with an electric jingle-bell on the ferryboat Chicago. The arrangement has been well tested, and will be applied to all the boats of the Pennsylvania fleet. Heretofore the jingle-bell on ferryboats has been similar in arrangement and operation to an ordinary door bell. The wires extended from the engineer's room, where the bells are located, to the pilot house, where the bell pulls were all arranged alongside of each other. On dark, disagreeable nights there was the possibility of the pilot getting hold of the wrong pull and giving the wrong signal to the engineer. The accident that befell the New Jersey some months ago at the Desbrosses street slip, on the New York side, is supposed to have been due to this cause. The pilot claimed that he had rung the gong, while the engineer held that the jingle-bell had been pulled, causing him to go forward instead of stopping. In case of a severe shock, as frequently happens, the jingle-bell will ring, and the engineer is at a loss to know whether the pilot has rung the bell, or whether it is due to the force of the shock. By the use of the electric jingle-bell such accidents and occurrences are impossible. The bell in the engine room is a stationary gong, which, when rung by the pilot, gives a number of quick, clear notes as it is tapped by a hammer. The button, which is pressed by the pilot, is arranged in a handle fastened to the electric wire, which is suspended directly over the wheel and held in position by guys. The possibility of sounding the wrong signal and the jingle-bell being rung by reason of shock is removed, and absolute safety afforded in this direction. This bell was introduced at the suggestion of Capt. Bloomsburgh, the superintendent of ferries, and has given entire satisfaction. The steam steering apparatus recently introduced on the Chicago and Baltimore has also given satisfaction, and as the boats are sent to Hoboken for repairs, the electric jingle-bell and the steam steering gear will be placed on each of them.

—— The new Block Island cable is working satisfactorily.

—— The Carbondale Light, Heat and Power Company have begun operations to put in 1000 sixteen-candle power lamps, at Carbondale, Pa.

—— The Pittsburgh Electric Light Company have commenced the erection of a 2000 light Westinghouse Plant on the South Side, Pittsburgh, Pa., the contract being awarded to Westinghouse, Church, Kerr & Co.

—— Mr. Sellars, of Birkenhead, has devised a manual engine, worked by self-releasing grips, and a rope passing over pulleys, with a maximum of friction, by which one man can drive a dynamo with sufficient speed to maintain a couple of 10-candle incandescent lamps. The maker suggests that for the various purposes to which a current of short duration may be applied, this machine will often prove more convenient and economical than the use of batteries.

—— In Cambridge board of aldermen last week the Mayor was authorized to contract with the Cambridge Electric Light Company for lights upon seven streets of the city, at 55 cents per light per night for one year. No action was taken on the petition of the Thomson-Houston Company for leave to introduce its system of lighting into Cambridge. An order was introduced authorizing the Mayor to petition the legislature in regard to amending the boundary line between Cambridge and Somerville.

—— The Council committee having under consideration the ordinance for an underground system of laying the electric wires, met at Minneapolis, Nov. 29, and after addresses by Col. A. F. Rockwell, of Washington, Supt. McKinstry, of the telephone company, and others, decided to recommend that the ordinance be passed to take effect Nov. 1, 1889. The committee also favor allowing any company so disposed the privilege of trying the underground system, as soon as they may wish.

—— At the meeting of the South Wales Institute of Engineers, Cardiff, on Tuesday last, Mr. Hann, one of the managers of the Powell-Duffryn Collieries, described the method patented by him for lighting miners' lamps by means of electricity so as to avoid there ever being a naked light in the mines. The current is supplied by accumulators "of such low power that they may be placed anywhere in the mine with safety." Mr. Mordey also read a paper on the electric lighting of mines one of the features of his scheme being to surround incandescent lamps with water.

—— The Navy Department has received the following bids to furnishing an electric plant and fixtures for the cruiser Chicago: Edison Company, vertical 12 by 9, or Armstrong & Siemens 12½ by 10, $8,280; Brush Electric Company, "Brotherhood" 8-inch, $11,380, and Armstrong & Siemens, $10,020; United States Electric Light Company, Armstrong & Siemens, 12½ by 10, $13,775; Sawyer-Man Electric Company, Armstrong & Siemens, 10 by 9, $20,958.34; Westinghouse, 9½ by 9, $20,708.34; Westinghouse, 8½ by 8, $20,458, and Straight Line, $21,458,34; and Mather Electric Company, Armstrong & Siemens, 12½ by 10, $10,632.50. The bids on fixtures alone were: Mitchell, Vance & Co., $1,468.68, and William P. Page & Co., $2,133.80. There are now five vessels of the Navy lighted by electricity—the Boston, Atlanta, Dolphin, Trenton, and Omaha. The contractor on each of them has had a losing job.

—— The passage of the Suez Canal, which until recently occupied from thirty-six to forty-eight hours, can now be made in sixteen hours for vessels fitted with the electric light apparatus. This important advance is the result of a very interesting report by Commodore Hector, of the steamer Carthage belonging to the Peninsular and Oriental Company, and addressed to the directors. This report was written after the Carthage made the first continuous passage, under the authorization of the Canal Company, giving the 1st of December, 1885. The Carthage arrived at Suez after a run from Port Said of eighteen hours. The actual running time was sixteen hours, there having been two delays caused by impediments in the channel; the mean speed made was 5.32 miles per hour.

—— The steamship Tallahassee, running from New York to Savannah, Ga., will hereafter be lighted by electricity from stem to stern. The work of putting in the wires and attaching the lamps has been going on for several weeks, in port and at sea, and the old-fashioned oil lamp, which a very short while since was thought to be a "thing of beauty and a joy forever," gave way for the bright, clear electric light. The dining cabins, saloons, state rooms and kitchens were all as bright, if not brighter, than sunlight could have made them. The lighting plant is divided into currents, so that the light can be turned off or on in cabins or other parts of the ship. Similar improvements were going on in the other ships of the Ocean Steamship Company, and before another month it is probable that the entire fleet of magnificent steamships owned by the company will be lighted by incandescent lights, and provided with electric call bells. These improvements will add greatly to the comfort of the patrons of the line and the popularity of the vessels, which are now the favorites with all those who "go down to the sea in ships" for business or pleasure.

—— William T. Meech, engaged as engineer at the electric light station, at Quincy, Ill., met with an accident that will, it is feared, cripple him for life. The dynamos had been started. It was found necessary to change a switch.. In order that the break in the circuit might be momentary only, haste was made in making the change. Two of the switch plugs had been safely deposited by Meech. He then seized the other two plugs to place them in the switch board. The metal tips of the plugs were drawn together; the unfortunate man's body completed the circuit, and the full generative force of a forty-five horse-power dynamo was passing through him. He fell to the floor as if shot. The plugs were yet in his hands. In mortal agony he lay, unable to free himself. Manager John McTwiggan, who was in another part of the building, rescued Meech with all expedition. The top of the small finger of his right hand was completely burned off; the flesh between the knuckles and base of the fingers on the same hand was burned out; the palm arch of the left hand was entirely destroyed. He suffered the most intense pain, not alone from the wounds but through his electric surcharged system. An idea of the extent of the wounds may be gained from the fact that a view of the switch-board was hidden by the blue smoke that arose from the burning hands.

ELECTRIC LIGHT NEWS

—— Abington will be lighted by electricity. H. H. Pratt, George L. Richardson and Henry B. Pierce are interested.

—— The Haverford Electric Light Company, of Haverford, Pa., have increased their capital stock from $5,000 to $50,000.

—— The custom house at New Orleans is being wired for the installation of an electric light plant to light the building from top to bottom, instead of gas which is now in use.

—— At the Edinburgh International Exhibition a gold medal was awarded to Messrs. Laing, Wharton and Down, as exhibitors of the Thomson-Houston arc lighting system.

—— The contract for an incandescent plant of 600 lights for the State Insane Asylum, at Marion, Va., has been awarded to Westinghouse, Church, Kerr & Co., New York City.

—— The Portsmouth, N. H., Electric Light Company have started up their new station. The installation is a great success. They are using the Armington & Sims engine to furnish power.

—— The Common Council, of Trenton, N. J., awarded the contract for 22 new arc lights for street lighting to the Peoples' Electric Light Company. All the lights are to be of 2,000 candle-power.

——An additional fifty-light plant of the American system of electric lighting was shipped to the St. Paul Gas Company this week. This is a rapid increase since the Gas Company commenced to use the lights.

—— The Cook County Electric Light Company has been incorporated at Chicago, with the capital stock of $500,000. The incorporators are Frank H. Collier, Charles M. Walker, and Charles N. Nicholas.

—— New England towns are taking the lead in illuminating with electricity. Biddeford, Me., put in a 100-light plant. The American system, which seems to be doing a great business in New England, is the favored company.

——Mr. Thos. J. Pray, Jr., the general manager of the Mather Electric Company, of Hartford, Conn., resigned on Monday last. It is said that he will continue in the electrical field, as he is interested in some valuable patents.

—— The Essex County Light, Heat and Power Co., of East Orange, N. J., has been organized with a capital stock of $50,000 H. H. Westinghouse, Pittsburgh, Pa., Walter C. Kerr, Brooklyn, N. Y., and William Lee Church, Orange, incorporators.

—— Dr. Robert Amory, of Brookline, Mass., writes us to say that he has contracted for two 45-light dynamos and 50 arc lights of the American system to be put in by Sowdon, Eider & Wright, of Boston, instead of a 300 arc light plant as stated Nov. 26th.

——The American Illuminating Company of Norwich, N. Y., was formed last week. An exclusive franchise was granted to it by the president and trustees of the Village Council. The company commences operation by installing a fifty-light plant, which has been ordered.

—— We learn that a number of capitalists, including Wilson S. Bissell, Charles W. Goodyear, J. F. Moulton, Daniel O'Day and others have already entered into negotiations with the Westinghouse Company with a view of starting a company in Buffalo, and of securing all their apparatus from them.

—— Messrs. W. Duke, Sons & Co., of Durham, N. C., and Blackwell's Durham Tobacco Co. have contracted with the Durham Electric Light Co. to light their respective factories, beginning January 1. Messrs. W. Duke, Sons & Co. contract for fifteen arc lights, and Blackwell's Durham Tobacco Co. contract for twenty-five lights.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING DEC. 7, 1886.

353,683 Conductor for mechanical telephones; John S. Jones, Brooklyn, N. Y.

353,684 Conductor for mechanical telephones; John S. Jones, Brooklyn, N. Y.

353,694 Telephone transmitter; James W. McDonough, New York, N. Y.

353,715 Telegraph transmitter; Jas. W. Shryock, Trinidad, Col.

353,755 Telephone; Noyes F. Palmer, Jamaica, N. Y.

353,757 Voltaic battery; August F. W. Partz, Philadelphia, Pa., assignor to the Partz Electric Battery Company, same place.

353,766 Automatic fire extinguishing apparatus; Alfred Thompson and Robert O. Ritchie, London, England.

353,783 Incandescent electric lamp; Thomas A. Edison, Menlo Park, N. J., assignor to the Electric Light Company, New York, N. Y.

353,789 Railway telegraph; Edward B. Ives, New York, N. Y.

353,797 System of lighting cars by electricity; Joseph H. Marshall, Grand Rapids, Mich.

353,827 Dynamo electric igniting machine; H. Julius Smith, Mountain View, N. J.

353,829 Electrical propulsion of vehicles; Frank J. Sprague, New York, N. Y.

353,840 Electric clock for transmitting signals; J. S. Bailey, Buckingham, Pa.

353,880 Electro-magnetic car brake; Harvey S. Park, Henderson, Ky.

353,915 Electrical testing; Charles S. Bradley, New York, N. Y., assignor to the Edison Electric Light Company, same place.

353,940 Telephone apparatus for divers; Hammond V. Hayes, Cambridge, Mass.

353,984 Coupling for electrical conductors; Walter F. Smith, Philadelphia, Pa.

353,986 Regulator for dynamo electric machines; Elmer A. Sperry, Chicago, Ill.

353,987 Electric motor; Elmer A. Sperry, Chicago, Ill.

353,988 Regulator for dynamo electric machines; Elmer A. Sperry, Chicago, Ill.

353,989 Annular armature for dynamo electric machines; Elmer A. Sperry, Chicago, Ill.

353,990 Electric regulator; Elmer A. Sperry, Chicago, Ill.

354,001 Printing telegraph instrument; Aloys Wirsching, Brooklyn, N. Y.

BUSINESS NOTICE.

"In making the statements which follow we can verify each and all of them as facts. Mr. Edward P. Thompson, of Temple Court [7 Beekman St.,] New York, is a good man to bring your patent cases to, for he is thoroughly versed in all the ins and outs of a Patent Attorney's duties. The following are some of his qualifications: Graduate of Stevens Institute as Mechanical Engineer. For four years tutor of classes of young men in mathematics and experimental physics at Elizabeth, N. J. Served professionally as Electrician and Chemist in the Swan Electric Company of New York for two years. Because of past successes as a Patent Attorney at 13 Park Row, New York, was appointed, to succeed N. S. Keith, of the patent agency of the *Electrical World* and Associate Editor. N. S. Keith is known as the Translator and Reviser of Schellen's Treatise on "Dynamo Electric Machinery." Mr. Thompson for two years personally prepared and prosecuted all the patent business of *Electrical World's* Patent Agency, and is the author of a series of articles in said paper upon "Analytical and Systematic Method of Inventing," which were widely known and favorably received. Mr. Thompson is a member of American Institute of Electrical Engineers and American Society of Mechanical Engineers. He is author of the "Expansion of Polynomials," which the ablest mathematicians of the world universally commend." —*New York Observer.*

NEW YORK & WASHINGTON ELECTRICAL PATENTS.

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A. C. FOWLER, C. E., Attorney at Law, EXAMINER IN U. S. PATENT OFFICE, 1880 to 1886, ELECTRICAL DIVISION. Office, Temple Court (Beekman and Nassau Streets), New York City.

CHAS. D. FOWLER, Counselor at Law. Office, Pacific Building (622-4 F Street, half block east Patent Office), Washington, D. C.

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Fig.259

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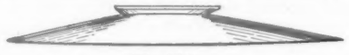

Fig.255

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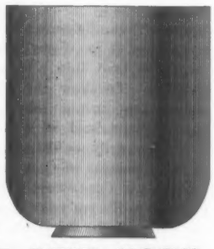

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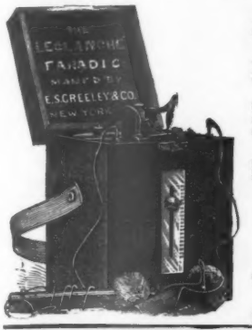

It is a new departure, and avoids the use of all obnoxious acids that destroy the clothes, stain the hands and make the constant handling of such medical batteries absolutely dangerous.

It is simplicity itself, and in ordinary use will run ONE YEAR WITHOUT ANY ATTENTION, OR THE EXPENDITURE OF A SINGLE PENNY FOR SUPPLIES.

There is no zinc to raise or lower, no fluids to be renewed. It is always ready, and does not corrode when not in use. Its first cost and the subsequent expense is far less than that of the dangerous red or white acid batteries heretofore manufactured.

The LECLANCHE FARADIC has three currents, is nickel-plated and mounted in an ornamentally covered case, 8¼x6¾x5¼ inches in size, and sold at the low price of $8.50.

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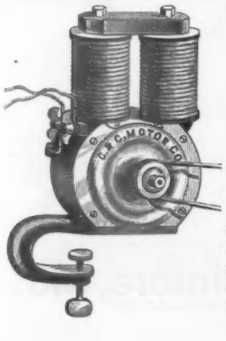

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The above Sale is adjourned to Monday, Dec. 29, at same time and place.

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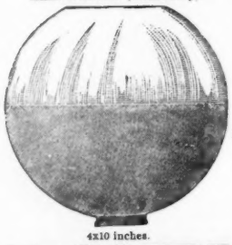

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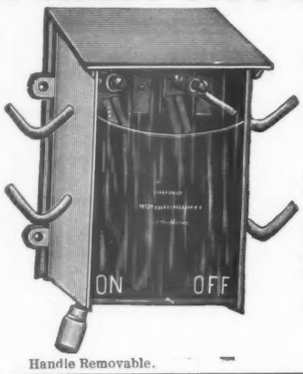

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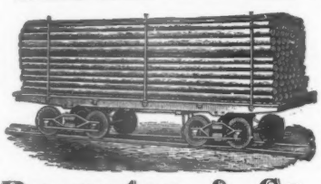

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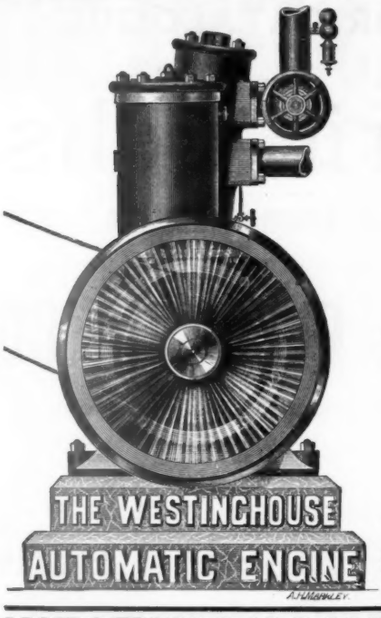

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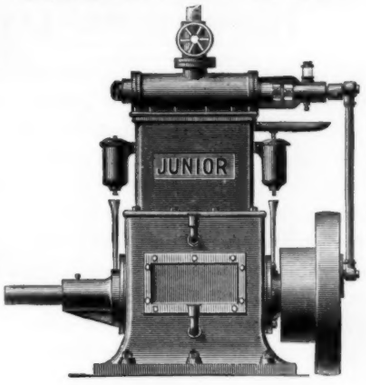

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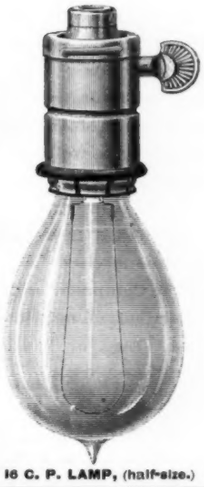

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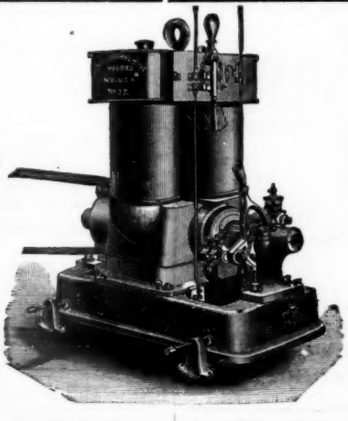

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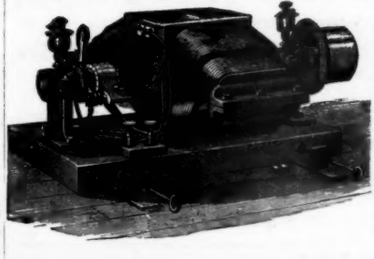

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On May 17, 1882, the public were cautioned against making investments in any scheme or venture based upon the claims of one Camille Alphonse Faure, relating to secondary or storage batteries or accumulators, and notice was then given that the Brush Electric Company, of Cleveland, were the rightful owners in this country of the inventions laid claim to by Faure and others, and were enforcing their rights by proceedings, before the proper tribunals of this government. Those proceedings have been pushed with diligence by the Brush people, and have been opposed and delayed in every possible way by the Faure interests and others, for a period of four years. Decisions, however, have at last been rendered in favor of the Brush interest, and patents have been granted to it covering the entire ground claimed by the Faure people, and the Faure patent is thus rendered valueless; twenty-seven patents, covering the field above referred to, and of cognate scope, have been granted to the Brush Electric Company, and one or more of them cover all the commercial batteries that have been up to now devised. The two principal and foundation patents, which control the use of the so-called Faure storage battery, as well as the Sellon-Volckmar battery, and others in the country, and supersede the patent issued to Faure January 3, 1882, numbered 252,002, are dated and numbered respectively, March 2, 1886, No. 337,298, and March 2, 1886, No. 337,299. The public are again advised, as they were in 1883, of the rights of the Brush Electric Company, and that these rights will be enforced.

Particulars may be learned of the undersigned, or of William C. Witter, Esq., or William H. Kenyon, Esq., their counsel, 32 Park Place, New York.

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It Contains Descriptions and Illustrations of a large assortment of goods in this line.

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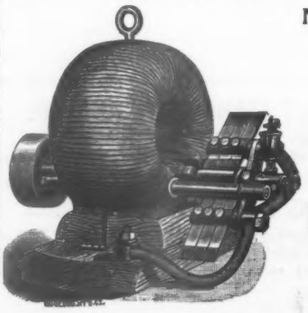

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THE AMERICAN SYSTEM OF ARC LIGHTING.

COMBINATION OF GAS AND ELECTRIC LIGHT INTERESTS

The *New York Daily Tribune* of November 16th inst. published an article upon this subject from which the following is copied:

NO MORE GAS WARS.

"Those who have heretofore entertained any doubts regarding the ultimate success of electric lighting as a solid business industry, and the "important position which its advocates have always claimed it would yet command in the commercial sense, have at last become convinced that "their skepticism upon this subject has been ill-founded.

"The enormous increase in the use of the arc light during the last year is exciting considerable attention in commercial circles. A some-"what significant and startling feature in the business is the fact that the more advanced and progressive gas managers are waking up to the "importance of the great strides now being made in the electric arc light field, and are now generally accepting the theories which have for the "last four or five years been so strenuously advocated by Mr. Edwards H Goff, the founder of the American system of electric lighting, viz.: that "the genuine interests of the gas and electric light companies were identical, that they should work together as allies, instead of opposing each "other as common enemies.

"One of the strong points which Mr. Goff has always made in his arguments is that the increased use of the electric light would invariably "cause increased consumption of gas, particularly where the electric light was used for street illumination. Mr. Goff's ideas upon this did not at "first meet with any favor whatever with the gas or electric light companies, outside of his own, and were generally opposed and scouted, when-"ever discussed, until during the last few months. It seems that a complete revolution has taken place in the minds of the gas people, and now "many of the gas companies are adopting the electric light themselves for street lighting, and nearly all of the companies are seriously consider-"ing the matter.

"From a recent circular issued by the American Electric Manufacturing Company, of which Mr. Goff is president, it is discovered that two "wealthy gas companies have not only adopted the American electric light to operate in connection with their gas plants, but have actually become "general agents for the American Company in selling its apparatus. The companies alluded to are the St. Paul Gas Company, of St. Paul, Minn., "and the Citizens Gas Company, of Jacksonville, Fla. Mr. Goff certainly ought to feel that although his advanced ideas upon this subject did "not for a long time meet with any favor, the general adoption of them now by the gas companies as sound and business-like, is ample compen-"sation for his fidelity to the subject, especially as it is altogether likely that the gas interests of the country will naturally look to the originator "of this plan of business as their material and loyal ally.

"Several other gas companies in different parts of the country are already adopting the American system of electric lighting."

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Pittsburgh Electric Company, Eugene Ingold, Genera Manager, 213 Wood St., Pittsburgh, Pa.—Wester Pennsylvania, Ohio, Kentucky and West Virginia.
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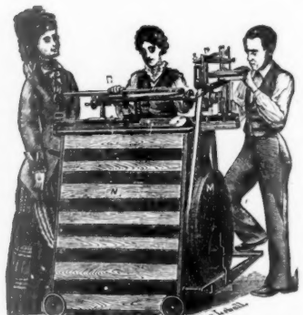

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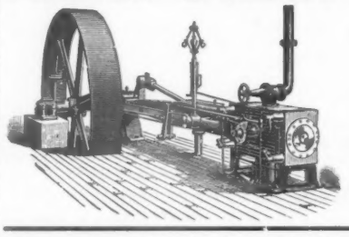

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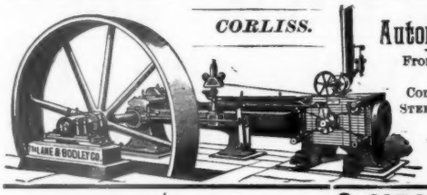

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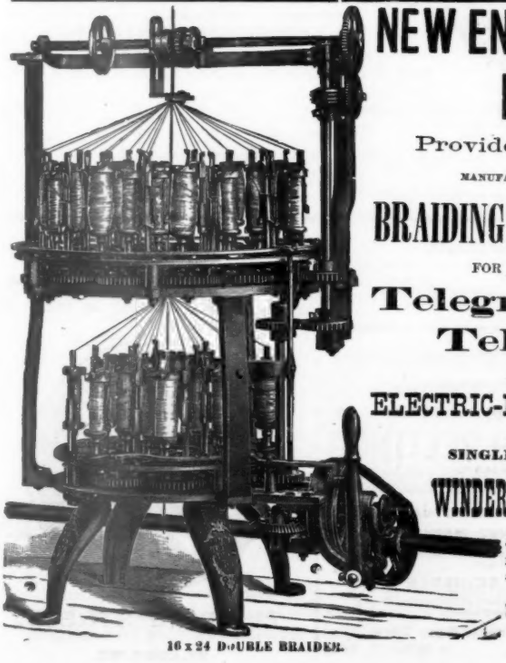

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